

## A revision of the genus *Doclea* Leach, 1815 (Crustacea, Brachyura, Majidae)

by H. P. WAGNER

**Résumé.** — Le nombre des espèces jusqu'à présent placées dans le genre *Doclea* s'élevait à trente-deux ; onze espèces seulement, dont l'une nouvelle pour la science, sont maintenant reconnues dans ce genre. Une clé est donnée pour les espèces traitées dans la présente publication. Des lectotypes sont désignés pour *D. hybrida* (Fabricius, 1798), *D. sebae* Bleeker, 1856, et *D. canaliformis* Lovett, 1981. Onze espèces qui avaient été précédemment attribuées à *Doclea* sont également discutées et leur statut actuel mentionné.

**Abstract.** — The number of species so far placed in the genus *Doclea* is thirty-two ; at present only eleven species, of which one is new to science, are recognized in this genus. A key is given to the species dealt with in this publication. Lectotypes are designated for *D. hybrida* (Fabricius, 1798), *D. sebae* Bleeker, 1856 and *D. canaliformis* Lovett, 1981. Eleven species previously assigned to *Doclea* are discussed also, with mention of their present status.

H. P. WAGNER, *Instituut voor Taxonomische Zoologie (Zoologisch Museum), Postbus 20125, NL-1000 HC Amsterdam, The Netherlands.*

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### INTRODUCTION

When LEACH in 1815 established the genus *Doclea*, he did so for *Doclea rissonii*, a new species from an unknown locality. Soon after that LATREILLE (1817) added *Egeria indica* Leach, 1815, *Inachus longipes* (L., 1758), *Inachus spinifer* (L., 1758) and *Inachus lar* (Fabricius, 1793) to the genus. In 1827, RISSO described *Doclea fabriciana* from the Mediterranean. LATREILLE (1828) relegated *Doclea* into the synonymy of *Phalangipus* Latreille, 1828, and added *Inachus ovis* (Fabricius, 1787) and *Inachus hybridus* Fabricius, 1798. He also stated that *Inachus longipes* and *Inachus lar* might be *Egeria*'s. RISSO's *Doclea fabriciana* was placed in the genus *Inachus* Weber, 1795, by H. MILNE EDWARDS (1834), who at the same time assigned *Egeria indica* and *Inachus longipes* to the genus *Egeria* Leach, 1815. The only species left in *Doclea* by H. MILNE EDWARDS were *Doclea rissonii* Leach, 1815, *Cancer ovis* Fabricius, 1787, *Inachus hybridus* Fabricius, 1798, and *Cancer muricatus* Fabricius, 1787. He ignored *Inachus spinifer* and *Inachus lar*, two species that LATREILLE (1817) placed in *Doclea*, evidently considering them species incertae. Subsequent authors also overlooked those two names entirely. DE HAAN (in VON SIEBOLDS, Fauna Japonica, 1839) figured the mouth parts of a new species that he named *Doclea armara*, but that is not mentioned elsewhere in his text. This species seems to be forgotten in the literature. Eight years later, WHITE (1847) described *Doclea calcitraba* from the Philippines. The ichthyologist Pieter BLEEKER proposed in his "Recherches sur les Crustacés de l'Inde Archi-

pélagique" (1856) five new species : *Doclea hybridoidea*, *Doclea macracanthus*, *Doclea microchir*, *Doclea sebae* and *Doclea brachyrhynchus*. A year later, STIMPSON (1857) described another two species, *Doclea gracilipes* and *Doclea canalifera*, both found near Hong Kong. Then it took twenty-two years until a new species, *Doclea orientalis*, from the north of Japan, was described by MIERS (1879) and another species was added when MIERS (1886) relegated *Libinia expansa* A. Milne Edwards, 1878, to the genus. A new species from Singapore was described in 1887 as *Doclea tetraptera* by A. O. WALKER. From a collection made at the Mergui Archipelago by Dr. John ANDERSON of the Indian Museum in Calcutta, DE MAN (1888) described *Doclea andersoni*. ORTMANN in his publication on the collection of the Strassburg Museum (1893) described *Doclea japonica* from Japan. He also added *Libinia bidentata* A. Milne Edwards, 1873, to *Doclea* and relegated *D. orientalis* into the synonymy of the latter species. Then ALCOCK (1895) made a thorough study of the species of the genus found in India. He treated *D. ovis* (with *D. japonica* as a variety), *D. canalifera*, *D. gracilipes* (*D. andersoni* is here relegated to the synonymy of *D. gracilipes*), *D. muricata* (of which he suspected that it is only the young form of *D. hybrida*), *D. hybrida* (with *D. hybridoidea* as possible synonym) and *D. tetraptera*. LAURIE (1906) described *Doclea alcocki* from the Pearl Banks in Ceylon. The first and only known *Doclea* from Australia was described in 1918 by RATHBUN after a specimen found at a depth of 250-450 fathoms. She mentioned the close relationship of the species with *D. expansa*, which she relegated to the synonymy of *D. orientalis*. According to BALSS (1929), *D. bidentata* is not a *Doclea* but a *Pugettia* or a *Hyas*. It is SAKAI (1938) who solved this problem by placing *D. bidentata* in the genus *Pisoides*. Then there is a long period in which there is no significant publication on *Doclea*, until, in 1981, LOVETT described and figured two new species, *Doclea canaliformis* and *Doclea johnsoni*, based on a manuscript of OW-YANG from 1963. In the same year DAI describes *Doclea sinensis*, as a new species from China. Finally *Doclea simeti* is described in 1986 by GRIFFIN and TRANTER.

In the period from 1815 until now in total 32 species of *Doclea* were recognized, of these 11 species are relegated to other genera or are doubtful. Of the remaining 21 species, 11 are placed here in the synonymy of others. A new species is described here so that a total of 11 species of *Doclea* are recognized in the present paper.

The present study is based on an examination of over 250 specimens (including most of the type-material) from several collections. Material from the following institutions was examined, British Museum (Natural History), London (BMNH); Muséum national d'Histoire naturelle, Paris (MP); Musée Zoologique de l'Université, Strassbourg (MZS); National University of Singapore, Singapore (NMS); Rijksmuseum van Natuurlijke Historie, Leiden (RMNH); University of Karachi, Pakistan (UKK); Smithsonian Institute, Washington (USNM); Zoologisch Museum, Amsterdam (ZMA); Universitetets Zoologiske Museum, Copenhagen (ZMC).

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**DOCLEA** Leach, 1815

*Doclea* Leach, 1815 : 41 (Type species, by monotypy : *Doclea rissonii* Leach, 1815. Gender : feminine).

The carapace is globular to subpyriform, with tubercles and/or spines ; it is covered with a short dense pile. The rostrum is bifid. The orbital margin is swollen and separated from the postorbital spine by a slit. Behind the rostrum there is a pair of submedian tubercles, followed by a median line of tubercles or spines. There are also two rows of submedian tubercles that diverge posteriorly. The anterolateral border is armed with four spines, of which the first is situated on the outer edge of the pterygostomial region and the other three on that of the branchial region. The last anterolateral spine is placed slightly more dorsally than the rest.

The outer angle of the buccal frame is produced into a spine, anteriorly of which there are two smaller spines of the basal antennal segment. This segment forms the lower part of the orbit. There is no pterygostomial ridge.

The legs are tomentose and one to four times as long as the carapace. The propodus sometimes can be purplish red of colour.

The animals are beige to brown or greyish brown.

The genus has a close resemblance to the genera *Pisoides* A. Milne Edwards & Lucas, 1843, *Neodoclea* Buitendijk, 1950, *Libinia* Leach, 1815, and *Libidooclaea* A. Milne Edwards & Lucas, 1843. The genus *Pisoides* can be easily distinguished from *Doclea* by the presence of a pterygostomial ridge that often shows tubercles, and the absence of a clear median line of tubercles, because there is no difference in size between the median and submedian tubercles. *Neodoclea* has a simple rostrum (bifid in *Doclea*) ; the buccal cavity is unarmed (with an anterolateral spine in *Doclea*) ; the merus of the third maxilliped is narrower than the ischium and tapers regularly distally (broader than the ischium and with the anterior angle produced in *Doclea*) ; and the first male pleopod of *Neodoclea* closely resembles that of *Libinia* and is clearly different from the first male pleopods of the species of *Doclea*. In *Libinia* there are often more than four anterolateral spines on the carapace and the metabranchial region often carries several tubercles or spines ; the tip of the first male pleopod in *Libinia* is bifurcated (simple in *Doclea*). In *Libidooclaea* there are more than four anterolateral spines on the carapace which also carries posterolateral spines ; the metabranchial region is armed with several tubercles or spines ; the first male pleopod has more resemblance to that of *Libinia* than that of *Doclea*.

**RANGE.** — Representatives of the genus can be found in the Indian Ocean and in the Western Pacific. There are records from South Africa, Mauritius, the coastal area from India to China, Indonesia, the Philippines and Japan.

KEY TO THE SPECIES OF THE GENUS *Doclea*

1. No spinules on the upper orbital margin. In the male spines or tubercles on the fourth thoracic somite. . . . . 2
- Spinules on upper orbital margin present. In the male a keeled ridge on the fourth thoracic somite, instead of spines. . . . . 9
2. Rostrum long, reaching beyond the spines of the epistome on the anterolateral angle of the buccal frame. . . . . 3
- Rostrum short, seldom reaching beyond the spines of the epistome on the anterolateral angle of the buccal frame. . . . . 10
3. 6 or 7 median tubercles or spines, of which only one is an intestinal spine. . . . . 4
- 8 or 9 median tubercles or spines, of which two are intestinal spines. . . . . 6
4. Pterygostomial canal present. First ambulatory legs up to 2 1/2 times as long as the carapace. The pile of hairs on the ambulatory legs reaches to the proximal part of the dactylus. The first male pleopod is stout, bent and, when mature, hairy for the larger part of its length. . . . . 5
- Pterygostomial canal absent. First ambulatory legs up to 4 times as long as the carapace. The pile of hairs on the ambulatory legs reaches to the proximal part of the propodus. The first male pleopod is smooth, almost straight and the distal appendage is abruptly narrowed, and angular in the middle; the tip is pointed. . . . . *rissonii* Leach
5. First male pleopod long, stout, bent and hairy in the basal two thirds. After the contortion there is a fine digitate tip that points anterolaterally. In the females the genital openings are oval and anteriorly. . . . . *ovis* (F.)
- First male pleopod long, stout, less bent and less hairy in the basal two thirds. The distal portion is formed by two broad, blunt contiguous lobes. In the females the genital openings are sub-circular and anterolaterally. . . . . *japonica* Ortmann
6. First intestinal spine placed dorsally on the base of the second intestinal spine. Ambulatory legs with a quadrangular shape because of the presence of four longitudinal rows of dense and rather long pile. Chelae prominently keeled at the upper and lower border. . . . . *armata* De Haan
- Intestinal spines separate. Ambulatory legs without quadrangular pile. Chelae not keeled at the upper and lower border. . . . . 7
7. Pterygostomial canal absent. Abdominal segments 4, 5 and 6 in both the male and female coalesced. Only one hepatic tubercle present. . . . . *muricata* (F.)
- Pterygostomial canal present. All abdominal segments of the male and female free. Two or three hepatic tubercles. . . . . 8
8. Carapace globular with nine median tubercles or spines. Rostrum partly grooved. Two tubercles on the hepatic region, and ten on the inner anterior part of the branchial region, forming three rows of 4, 2 and 4 tubercles respectively. There is a small tubercle present at either anterior end of the metagastric region. . . . . *johnsoni* Lovett
- Carapace more or less rhomboid with eight median tubercles or spines. Two or three tubercles on the hepatic region, and seven on the inner anterior part of the branchial region, forming two rows of 3 and 4 tubercles respectively. There is a large conspicuous tubercle present at either anterior end of the metagastric region. . . . . *canaliformis* Lovett
9. Carapace subpyriform. One metabranchial tubercle present. Pterygostomial canal absent. The dense pile of the ambulatory legs reaches to the distal part of the propodus. All abdominal segments of the male and female free. Genital opening of the female situated on anterior side of a prominence. Distal part of first male pleopod is falcate and flat. . . . . *alcocki* Laurie
- Carapace globular. No metabranchial tubercle. Pterygostomial canal present. The dense pile of the pereopods reaches to the distal part of the carpus. Abdominal segments 4, 5 and 6 are

- coalesced in the female. Genital opening of female situated on posterior side of a prominence. Distal part of the first male pleopod strongly curved..... *aduncus* n. sp.
10. Protogastric region with three tubercles, branchial region with five tubercles. The pile of the ambulatory legs extends to the proximal part of the propodus. All abdominal segments of both male and female free..... *brachyrhynchos* Bleeker
- Protogastric region with two tubercles, branchial region with two tubercles. The pile of the ambulatory legs extends to the proximal part of the dactylus. Abdominal segments 3 to 6 of both male and female coalesced..... *macracanthus* Bleeker

### 1. *Doclea ovis* (Fabricius, 1787)

(Figs. 1-4 ; pl. I, II)

[without name] ; HERBST, 1785 : pl. 13 fig. 82.

*Cancer ovis* Fabricius, 1787 : 324. — HERBST, 1788 : 210. — FABRICIUS, 1793 : 459.

*Inachus ovis* ; FABRICIUS, 1798 : 355.

*Maia ovis* ; BOSC, 1802 : 256. — LATREILLE, 1803 : 100. — DESMAREST, 1830 : 274.

*Phalangipus ovis* ; LATREILLE, 1828 : 699.

*Doclea ovis* ; H. MILNE EDWARDS, 1834 : 294. — H. MILNE EDWARDS, 1838-1840 : pl. 33 fig. 2. — WHITE, 1847 : 3. — ADAMS & WHITE, 1848 : 7. — HOFFMANN, 1874 : 37. — A. O. WALKER, 1887 : 109. — ORTMANN, 1893 : 47. — ALCOCK, 1895 (Reprinted in 1968, Amsterdam) : 227. — RATHBUN, 1929 : 101. — GORDON, 1931 : 529. — ANDRÉ, 1931 : 645. — CHOPRA, 1935 : 467, text-fig. 1a. — SERÈNE, 1937 : 72 (part). — BUITENDIJK, 1950a : 66. — DAWYDOFF, 1952 : 139. — (OW-YANG, 1963 : 180, pl. 36 figs. A-C). — MICHEL, 1964 : 4. — GUINOT, 1967 : 294. — YANG, 1979 : 7. — GRIFFIN, 1974 : 11. — NATHEEWATHANA *et al.*, 1981 : 52. — LOVETT, 1981 : 119, 120 fig. 259. — GRIFFIN & TRANTER, 1986 : 115, fig. 34a.

*Doclea canalifera* STIMPSON, 1857 : 217. — ORTMANN, 1893 : 48. — ALCOCK, 1895 (Reprinted in 1968, Amsterdam) : 228. — NOBILI, 1903 : 28. — STIMPSON, 1907 : 7, pl. 1 fig. 4. — RATHBUN, 1910 : 318. — BALSS, 1924 : 30. — ? GEE, 1925 : 166. — GORDON, 1931 : 529. — ANDRÉ, 1931 : 646. — CHOPRA, 1935 : 469, text-fig. 1b. — SUVATTI, 1938 : 59. — ? SHEN, 1940 : 80. — BUITENDIJK, 1950a : 65. — PILLAI, 1951 : 7. — DAWYDOFF, 1952 : 139. — (OW-YANG, 1963 : 171). — YANG, 1979 : 7. — GRIFFIN, 1974 : 10. — LOVETT, 1981 : 119.

*Doclea muricata* ; HENDERSON, 1893 : 342. — LANCHESTER, 1900 : 722 (part). [Not *Doclea muricata* (F.).]

*Doclea japonica* ; ALCOCK, 1895 (Reprinted in 1968, Amsterdam) : 227. — NOBILI, 1903 : 28. — CHOPRA, 1935 : 467. [Not *D. japonica* Ortmann, 1893.]

*Doclea avis* (sic) ; SHERBORN, 1923 : 623. — SHERBORN, 1932 : 431.

*Doclea canaliculata* (sic) ; BALSS, 1929 : 15.

#### MATERIAL EXAMINED

Mauritius : 1842-1866 ; Lady F. COLE ; BMNH 581a : 1 ♂.

Indian Sea ; don. R. F. MAILLARD ; ZMA : 1 ♀.

Pondichéry, India ; August 1901 ; M. MAINDRON ; MP-B 12660 : 1 ♀. — MP-B 12661 : 2 ♂. — L. T. LESCHENAULT DE LA TOUR ; MP-BS 4485 : 1 ♂. — L. T. LESCHENAULT DE LA TOUR ; MP-BS 267 : 1 ♀. — L. T. LESCHENAULT DE LA TOUR ; MP-BS 266 : 1 ♂.

Madras, India ; J. R. HENDERSON ; BMNH 92.7.15.412-415 : 3 ♂, 2 ♀.

Vizagapatam coast, India ; 7 1/2-9 1/2 fathoms (= 13.72-17.38 m) ; don. Marine Survey of India ;

BMNH <sup>1787</sup><sub>7</sub> : 1 ♂.

Off Devi River, India ; 7-8 fathoms (= 12.80-14.63 m) ; don. Indian Museum ; BMNH 1911.1.17.68 : 1 juv. ♂.

? Bay of Bengal (possibly Tranquebar) ; India ; Sir Joseph BANKS coll. ; I. K. DALDORFF ;

BMNH : 1 ♂, 2 ♀. — 1790-1793 ; I. K. DALDORFF ; RMNH 36156 : 1 ♀ (paralectotype of *Doclea hybrida* (F.)). — FABRICIUS coll. ; ZMC : 2 specimens<sup>1</sup> (? syntypes *Doclea ovis* Fabricius).

Bay of Bengal, off Burma ; 20°16' N-92°32' E ; 13-15 m ; trawl ; 5 April 1963 ; « Anton Bruun » ; sta. 47a ; USNM 135251 : 1 juv. ♂. — South of Chittagong ; 20°27' N-92°20' E ; 19-20 m ; trawl ; 5 April 1963 ; « Anton Bruun » ; sta. 47 ; USNM 135126 : 4 juv. ♂. — South of Chittagong ; 21°00' N-91°59' E ; 23-25 m ; trawl ; 5 April 1963 ; « Anton Bruun » ; sta. 46 ; USNM 135125 : 2 juv. ♂, 1 juv. ♀ ; USNM 135128 : 8 ♂, 15 ♀. — Trawl ; « Anton Bruun » ; sta. 57 ; BMNH : 1 juv. ♂.

Andaman Sea, southwest of Rangoon ; 15°18' N-94°54' E ; 35 m ; trawl ; 1 April 1963 ; « Anton Bruun » ; Sta. 42 ; USNM 135124 : 1 juv. ♀. — 15°04' N-95°51' E ; 44-46 m ; trawl ; 31 March 1963 ; « Anton Bruun » ; sta. 41 ; USNM 135122 : 1 juv. ♀. — Trawl ; 31 March 1963 ; « Anton Bruun » ; Sta. 41a ; USNM 135123 (part) : 7 juv. ♂, 7 juv. ♀.

Ko Lanta Noi Islands, East of Phuket, Thailand ; 31 December 1973 ; ZMC : 1 ♀.

Batu Maung, Penang, Malaysia ; 05°17' N-100°17' E ; 16 January 1983 ; L. B. HOLTHUIS & WONG TAT MENG ; RMNH 35965 : 1 ♂ ; RMNH 35987 : 1 ♂, 2 ♀.

Penang, Malaysia ; 1879 ; Th. E. CANTOR ; BMNH : 1 ♂ ; BMNH 1879.32 : 1 ♂.

Port Swettenham, Selangor, Malaysia ; December 1934 ; don. Raffles Museum ; RMNH 5440 : 1 juv. ♀.

Malacca ; 1-2 feet (= 0,30-0,61 m) ; mud ; F. P. BEDFORD & W. F. LANCHESTER ; BMHN 1900.10.22.10 (part) : 1 juv. ♀.

Kuala Johore, Singapore ; mud, mussel beds ; ? gravel ; 17 June 1954 ; NMS 1984.6431-6436 : 2 juv. ♂, 4 juv. ♀.

East coast, Singapore ; December 1982 ; C. M. YANG ; NMS : 1 ♀<sup>2</sup> ; May 1983 ; C. M. YANG ; NMS : 2 ♂<sup>2</sup>.

Marine Parade, Singapore ; silty mud ; 22 april 1960 ; NMS : 1 ♂<sup>2</sup>.

Siglap, Singapore ; 6 January 1934 ; NMS : 2 ♀<sup>2</sup>.

Off East Coast Lagoon, Singapore ; March 1981 ; P. K. L. NG ; NMS 1981.9.2.18 : 1 intersex. — March 1983 ; P. K. L. NG ; NMS : 3 ♂<sup>2</sup>. — P. K. L. NG ; don. University Singapore ; RMNH 36161 : 2 ♂.

Bedok, Singapore ; 17 fathoms (= 31.09 m) ; 5 September 1976 ; Fishery Research Station ; NMS : 1 ♀<sup>2</sup>.

Changi Point, Singapore ; 9 May 1982 ; C. M. YANG ; NMS : 1 ♀<sup>2</sup>.

South China Sea, near Singapore ; H. HUAT ; don. University Singapore ; RMNH 36160 : 1 ♂. — Ca. 150 miles off Singapore ; 19 August 1983 ; H. HUAT ; NMS : 2 ♂<sup>2</sup>. — Near Horsburgh lighthouse, Singapore ; 26 November 1982 ; H. HUAT ; NMS : 2 ♂, 2 ♀<sup>2</sup>. — About 30 miles from Horsburgh lighthouse, Singapore ; 10 September 1983 ; H. HUAT ; NMS : 2 ♂, 1 ♀<sup>2</sup>.

Off Pattani Bay, Gulf of Thailand, Thailand ; by fishermen ; leg. C. SWENNEN ; 14 November 1985 ; RMNH : 1 ♂.

Koh Samui, river mouth, between two pongs in, Sura Thani Province, Thailand ; 3 March 1985 ; L. B. HOLTHUIS & P. NAIYANETR ; RMNH : 1 ♀. — Beach ; 2 March 1985 ; L. B. HOLTHUIS & P. NAIYANETR ; RMNH : 1 carapace, 25 fragments.

Koh Kram, Thailand ; 30 fathoms (= 54.86 m) ; 2 and 21 March 1900 ; ZMC : 1 juv. ♂.

Koh Kahdat, Thailand ; 5-8 fathoms (= 9.14-14.63 m) ; sandy mud ; 6 February and 4 March 1900 ; ZMC : 1 juv. ♀.

Vietnam ; GERMAIN ; MP-BS 266 : 1 ♂, 1 ♀.

Cap St. Jacques, Vietnam ; at 30 m ; 18 January 1928 ; don. KREMPF ; MP-B 12663 : 1 ♀.

Nha-Trang, Vietnam ; R. SERÈNE ; MP-B 12662 (part) : 1 ♂.

Hong Kong ; BARNEY coll. ; BMNH 1930.12.2.263 : 2 ♀.

Makassar, 01°09' S-117°08' E ; 25 m ; Corindon 11 expedition ; sta. CH 203 ; MP-B 16954 (part) : 1 juv. ♂.

1. Specimens not seen personally, but studied from photographs.

2. Specimens studied by Prof. Dr L. B. HOLTHUIS. Not seen personally but sure of the identification, because Prof. Dr HOLTHUIS made notes and drawings of every specimen.

China ; BMNH 581b : 1 ♀.

Swatow, China ; 1883 ; Chinese coast Fisheries ; BMNH 84.2 : 1 ♀.

Yenting, Chekiang Province, China ; 18 July 1923 ; exchange National Southeastern University ; USNM 59168 : 1 ♂.

Atulayan Bay, Luzon, Philippines ; 130 feet seine (= 39.60 m) ; 17 June 1909 ; Albatross Philippine Expedition 1907-1910 ; USNM : 1 ♀.

? ; BMNH 1857.51 : 1 ♀ ; ZMA 100.410 : 1 ♀.

#### DESCRIPTION

The carapace is globular. The rostrum is incised in the middle for 2 mm at the utmost. Between the incision and the pair of submedian tubercles anterior of the median

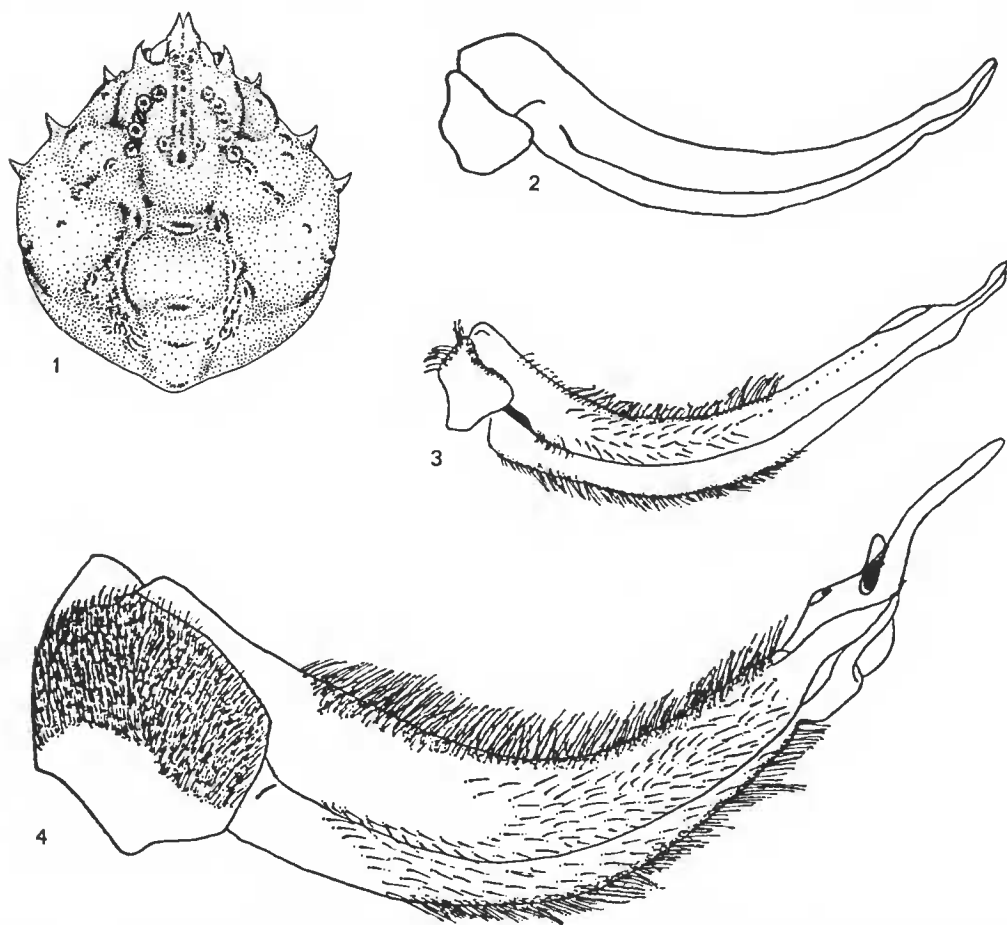


FIG. 1-4. — *Doclea ovis* (F.) : 1, ♂ (Bedok, Singapore, September 1960), carapace, dorsal view, 0.87 × (after OW-YANG) ; 2, juvenile ♂ (Batu Maung, Penang, Malaysia, 16 January 1983, RMNH 35965), right first pleopod, 6.7 × ; 3, half mature ♂ (Madras, India, BMNH 92.7.15.412-415), right first pleopod, 7.5 × ; 4, ♂ (Batu Maung, Penang, Malaysia, 16 January 1983, RMNH 35987), right first pleopod, 6.7 ×.

line the rostrum is clearly grooved. The tips of the rostrum are straight in adults. There is a narrow incision between the orbital margin and the postorbital spine. The outer edge of the postorbital spine is convex.

In its median line the carapace carries seven tubercles, of which the last two are the most pronounced, when the animal is not fully mature. The first four tubercles are placed in the mesogastric region, the fifth in the urogastric, the sixth in the cardiac and the seventh, which is directed backwards, is in the intestinal region.

In the posterior part of the frontal region, just before the anterior median tubercle, there is a pair of submedian tubercles. In either protogastric region a longitudinal row of two to four tubercles is present, the two rows diverging posteriorly. The first of these tubercles lies at the same level as the second median tubercle. The last is largest and placed at a level between the third and fourth median tubercle. The metagastric region shows a very small submedian tubercle at either end of the anterior margin. The hepatic region carries only one tubercle. Either inner anterior part of the branchial region has at the utmost seven tubercles of which one row of five tubercles. From the remaining two tubercles one is situated at a level slightly anterior to the third anterolateral spine and the other somewhat more medially and at a level somewhat behind the third anterolateral spine. The row of five tubercles starts in the anterior part of the region and curves towards the last anterolateral spine. This branchial row lies in a direct line with the protogastric row.

The anterolateral border of the carapace is armed with four tubercles or spines. The first is the smallest, the second and third are of equal size and the fourth is the largest. In large and old specimens the fourth anterolateral spine can be reduced to a blunt tubercle. A tubercle, up to  $1/5$  as long as the first anterolateral spine, is sometimes placed at the edge of the pterygostomial region.

The posterior spine of the basal antennal segment is very small. There is a pterygostomial canal present.

In the adult male the chelae are strongly swollen and almost three quarters of the carapace length. In the female the chelae measure less than half the carapace length. The ambulatory legs of the first pair is  $1\frac{1}{2}$  to  $2\frac{1}{2}$  times as long as the carapace. The ambulatory legs are thick and rounded and the dense pile extends from the base to the proximal part of the dactylus.

In the male all abdominal segments are separate ; the second abdominal segment has a blunt median tubercle. In the female the abdominal segments are also separate and the tubercle on the second abdominal segment is slightly broader than in the male.

In the male there are two submedian tubercles on the fourth thoracic somite, just before the seventh abdominal segment when the abdomen is in the normal position against the thorax. In the young males these tubercles are spinous. The spines function as some kind of locking device for the abdomen.

The first pleopod of the male, when fully mature, is well chitinized and circular in transverse section. It is long, stout, somewhat bent and hairy in the basal two thirds. After the contortion there is a fine digitate tip that points anterolaterally.



#### REMARKS

When young, the animals have spines on their carapace. When they grow older these spines reduce to tubercles or even can disappear under the dense pile. The description of *Doclea canalifera* Stimpson was based on a young male (RATHBUN, 1902 : 29). As the type material of *D. canalifera* is lost it is not certain whether the species are juveniles of *D. ovis* or of *D. japonica*. In the latter case the name *D. canalifera* has precedence over *D. japonica* and should be used instead. For the time being the name *D. canalifera* is treated here as a synonym of *D. ovis*. In the given synonymy of *D. ovis* all positive references to *D. canalifera* are those of which it is certain that they refer to young *D. ovis*. The references preceded by a question mark are those that might be either *D. ovis* or *D. japonica*. As I only have seen *D. ovis* from the type locality of *D. canalifera* (Hong Kong) it seems quite well possible that *D. canalifera* is a junior synonym of *D. ovis*.

#### HABITAT

The species is normally found on soft silty mud bottoms at depths of a few meters to 30 fathoms (= 54.86 m). Several specimens studied carried an anemone on the dorsal part of the carapace. Mr Peter NG, of the University of Singapore (*in litt.*), informed me this is usual for the species and that, when the anemones are removed, *D. ovis* will place them back onto its carapace. In some specimens Lepadidae were observed on the pereopods.

#### DISTRIBUTION

The species is known from Mauritius, India, Burma, Malaysia, Singapore, Thailand, Vietnam, Hong Kong and China, now reported for the first time from the Philippines.

The records of the species in the literature are the following : Madagascar (HOFFMANN, 1874) ; Mauritius (MICHEL, 1964) ; Madras, India (HENDERSON, 1893 ; CHOPRA, 1935) ; Travancore, India (PILLAI, 1951) ; Orissa coast, India (ALCOCK, 1895 ; CHOPRA, 1935) ; Arakan coast, India (ALCOCK, 1895 ; CHOPRA, 1935) ; mouth of Hooghly River, India (ALCOCK, 1895) ; Sandheads, India (CHOPRA, 1935) ; East India (probably Tranquebar) (FABRICIUS, 1787, 1793, 1798 ; HERBST, 1788) ; Bay of Bengal (GRIFFIN, 1974) ; Andaman Sea (GRIFFIN, 1974) ; Mergui Archipelago (CHOPRA, 1935) ; West Malay Peninsula (GRIFFIN & TRANTER, 1986) ; Malacca (LANCHESTER, 1900) ; Port Swettenham, Malaysia (YANG, 1979) ; Singapore (NOBILL, 1903 ; GRIFFIN, 1974) ; Siglap, Singapore (BUTENDIJK, 1950a ; YANG, 1979) ; Gulf of Thailand (YANG, 1979) ; Koh Kahdat, Thailand (RATHBUN, 1910) ; Koh Kram, Thailand (RATHBUN, 1910) ; Nha-Trang, Vietnam (ANDRÉ, 1931) ; Hong Kong (STIMPSON, 1857, 1907 ; GEE, 1925 ; GORDON, 1931) ; off Tamtoo Island, near Hong Kong (GEE, 1925) ; China (ADAMS & WHITE, 1848 ; SHEN, 1940) ; Yenting, China (GRIFFIN, 1974) ; Wenchow, Chekiang, China (SHEN, 1940) ; Foochow, China (GEE, 1925 ; SHEN, 1940).

## 2. *Doclea japonica* Ortmann, 1893

(Figs. 5-7)

- Doclea ovis*; SAKAI, 1938 : 293, pl. 37, fig. 2. — SHEN, 1940 : 80. — SAKAI, 1954 : 705, fig. 2038. — SAKAI, 1956 : 21. — UMINOMI, 1956 : 78, pl. 39, fig. 5. — SAKAI, 1965 : 676. — UMINOMI, 1965 : 78, pl. 39 fig. 5. — TAKEDA, 1975 : 128, fig. — SAKAI, 1976 : 231, pl. 80 fig. 2. — UMINOMI, 1978 : 78, pl. 39 fig. 5. — MIYAKE, 1983 : 207, pl. 15 fig. 2. [Not *D. ovis* (Fabricius, 1787).]  
*Doclea japonica* Ortmann, 1893 : 46, pl. 3 fig. 4. — GRIFFIN & TRANTER, 1986 : 114, figs. 34b, f, g, pl. 9.  
*Doclea canalifera*; RATHBUN, 1902 : 29. — URITA, 1926 : 33. — SAKAI, 1938 : 292, pl. 37 fig. 3. — SAKAI, 1956 : 21. — SAKAI, 1976 : 231, pl. 80 fig. 1. — MIYAKE, 1983 : 207, pl. 15 fig. 1. [Not *D. canalifera* Stimpson, 1857.]

### MATERIAL EXAMINED

- Nha-Trang, Vietnam; R. SERÈNE; MP-B 12662 (part) : 1 ♂.  
China; Gernair; MP-BS 268 : 1 ♂.  
Hsiamen (Amoy), harbour, China; from nets; June 1923; don. S. F. LIGHT; USNM 62028 : 1 ♂. — Hsiamen (Amoy), China; 6 June 1924; don. S. F. LIGHT; USNM 62026 : 1 ♀.  
Mimase, near Kochi, Shikaku, Japan; 17 May 1979; K. SAKAI, H. SUZUKI & L. B. HOLTHUIS; RMNH 32766 : 1 ♀.  
Kii Peninsula, Japan; BMNH 1961.6.5.135 : 1 juv. ♂. — 1881-1882; coll. L. DÖDERLEIN; ZMS : 2 ♀ (syntypes *D. japonica* Ortmann).  
Wakanoura, Kii, Japan; S. J. JORDAN & J. O. SNYDER; Stanford University; USNM 26271 : 2 ♂, 2 ♀.

### REMARKS

The difference mentioned by ORTMANN (1893 : 47) that *D. ovis* has a preorbital spine is based on a misinterpretation of the illustration in H. MILNE EDWARDS (1838 : pl. 33 fig. 2) of the basal antennal segment. What ORTMANN considered to be a preorbital spine, proved to be nothing but the basal antennal segment also present in *D. japonica*.

This species, however, can be distinguished by the shape of the male first pleopod and the female gonopore according to GRIFFIN & TRANTER (1986 : 115). In other respects the animals do not show any difference with *D. ovis*. Some of the material examined here from China and Japan was discussed by GRIFFIN (1974 : 10) and GRIFFIN & TRANTER (1986 : 115), who were of the opinion that these are probably *D. japonica* Ortmann.

The male gonopod is characterized by being long, stout, somewhat bent and hairy in the basal two thirds. The distal portion is formed by two broad, blunt contiguous lobes. In the female, GRIFFIN & TRANTER (1986) state, that the gonopore is subcircular in shape and situated anterolaterally on the genital prominence. The remaining two females of the type material of *D. japonica* were studied and hardly differ in shape and position of the gonopore as found in *D. ovis*. I also was able to examine material from China and Vietnam, the former being *D. ovis*, the latter consisting of two males, one *D. ovis* and one *D. japonica*. However, I have some reservation in accepting them as distinct species, it seems best, for the time being at least, to maintain *D. japonica* as a distinct species, especially as a relative large number of specimens of this species came to my attention.

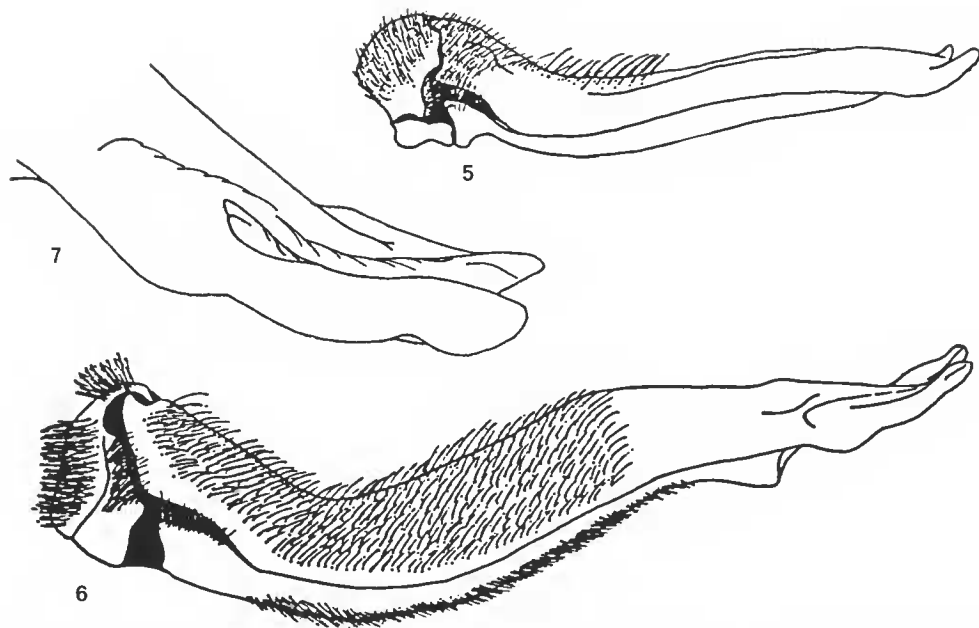


FIG. 5-7. — *Doclea japonica* Ortmann : 5, half mature ♂ (Wakanoura, Kii, Japan, 1900, USNM 26271), right first pleopod, 6.5 × ; 6, ♂ (Nhatrang, Vietnam, MP-B 12662), right first pleopod, 6.5 × ; 7, detail of the tip of the first pleopod of figure 6, 30 ×.

It is uncertain whether STIMPSON's type material from Hong Kong, described as *Doclea canalifera*, is a young of this species or of *D. ovis*. The nomenclatorial status of *D. canalifera* may ultimately be established by the selection of a male neotype from Hong Kong.

**HABITAT.** — The species inhabits the same biotope as *D. ovis*.

#### DISTRIBUTION

The species is known from Japan, China, Formosa and for the first time reported from Vietnam.

The records of the species in the literature are the following : Takao, Formosa (GRIFFIN & TRANTER, 1986) ; Hsiamen (Amoy), China (GRIFFIN, 1974) ; Futschau, Fukien, China (GRIFFIN & TRANTER, 1986) ; Yenting, China (GRIFFIN & TRANTER, 1986) ; Foochow, China (GRIFFIN, 1974) ; Nagasaki, Hizen, Japan (RATHBUN, 1902) ; Kagoshima Bay, Kyusu, Japan (SAKAI, 1938) ; Sibusi, Ohsuma Peninsula, Japan (URITA, 1926) ; off Izaku, Satuma Peninsula, Japan (URITA, 1926) ; Miyazaki Prefecture, Japan (SAKAI, 1938) ; Tosa Bay, Japan (SAKAI, 1938) ; Mimase, Tosa Bay, Japan (SAKAI, 1938, 1976) ; Kochi, Japan (ORTMANN, 1893) ; Tutugahama, Kii Peninsula, Japan (SAKAI, 1938) ; Coast of Wakayama, Kii Peninsula, Japan (SAKAI, 1938) ; Gobô, Kii Peninsula, Japan (SAKAI, 1938) ; Wakanoura, Japan (GRIFFIN & TRANTER, 1986) ; Minabe, Kii Peninsula, Japan (SAKAI, 1976) ; Nagashima, Mie Prefecture, Japan (SAKAI, 1976).

### 3. *Doclea rissonii* Leach, 1815

(Figs. 8-11 ; pl. II, III)

- Araneus, seu Cancer marinus, rotundatus Seba, 1759 : 41, pl. 17 fig. 4.  
*Doclea rissonii* Leach, 1815 : 42, pl. 74. — CUVIER, 1816 : 22. — LATREILLE, 1817 : 517. — WHITE, 1847 : 3.  
*Doclea rissonii* ? ; GUÉRIN-MÉNEVILLE, 1827-1828 : 4, pl. 17 fig. 4.  
*Doclea rissoni* ; ORTMANN, 1893 : 47.  
*Doclea sebae* Bleeker, 1856a : 13 (part). — BLEEKER, 1857 : 13 (part).  
*Doclea gracilipes* Stimpson, 1857 : 216. — ORTMANN, 1893 : 48. — ALCOCK, 1895 (Reprinted in 1968, Amsterdam) : 229. — LAURIE, 1906 : 381. — STIMPSON, 1907 : 6, pl. 1 fig. 1. — GEE, 1925 : 166. — CHOPRA, 1935 : 470, text-fig. 1c. — SHEN, 1940 : 80. — CHHAPGAR, 1957 : 412, pl. 3 fig. o, p. — (OW-YANG, 1963 : 176). — CHANDY, 1973 : 401. — SANKOLLI & SHENOY, 1975 : 126, fig. 1d. — YANG, 1979 : 7. — LOVETT, 1981 : 121. — GRIFFIN & TRANTER, 1986 : 113.  
*Doclea andersoni* De Man, 1888 : 11, pl. 1 figs. 1, 2. — ORTMANN, 1893 : 47. — SHEN, 1940 : 80.  
*Doclea* sp. ; DE MAN, 1888 : 13.  
*Doclea sinensis* Dai, 1981 : 36, 38, pl. 1 figs. 1-5.

#### MATERIAL EXAMINED

- Sri Lanka (Ceylon) ; W. A. HERDMAN coll. ; BMNH 1907.5.22.124-128 : 3 juv. ♂, 4 juv. ♀.  
Andaman Sea, south of Rangoon ; 15°04' N-95°51' E ; 29-33 m ; trawl ; 31 March 1963 ; « Anton Bruun » ; sta. 41a ; USNM 135123 (part) : 1 ♂, 2 juv. ♀.  
Mergui ; leg. J. ANDERSON ; BMNH 86.52 : 1 juv. ♀.  
Singapore ; don. Fisheries Research Station ; BMNH C9/15 : 1 ♂. — 11-19 May 1982 ; P. K. L. NG ; University Singapore ; RMNH 36162 : 75 zoea-I-larvae, 7 zoea-II-larvae, 6 megalopa-larvae.  
East coast, Singapore ; 1982 ; don. University Singapore ; RMNH 36160 : 1 ♂.  
South China Sea, near Singapore ; H. HUAT ; don. University Singapore ; RMNH 36160 : 1 juv. ♂.  
Bay of Djakarta (Batavia), Java, Indonesia ; March 1911 ; P. BUITENDIJK ; RMNH 3151 : 1 ♀.  
Hong Kong ; BARNEY coll. ; BMNH 1930.12.2.262 : 1 juv. ♂.  
Hsiamen (Amoy), China ; don. C. J. SHEN ; BMNH 1935.3.19.123 : 1 juv. ♀.  
Tsimei, China ; coll. & don. S. F. LIGHT (University of Amoy) ; June 1923 ; USNM : 2 ♂, 2 ♀.  
Locality unknown ; W. E. LEACH ; BMNH 81a : 1 ♀ (holotype of *Doclea rissonii*). — 13 May 1982 ; don. University Singapore ; RMNH 36159 : 1 ♀ ; don. Muséum Paris ; RMNH 36154 : 1 ♀.

#### DESCRIPTION

The carapace is globular. The rostrum is incised in the middle for 1.5 mm at the utmost. Between the incision and the pair of submedian tubercles anterior of the median line the rostrum is clearly grooved. In adults the tips of the rostrum seem to be bend slightly towards each other, because the outer edge of each tooth is slightly convex. There is a narrow incision between the orbital margin and the postorbital spine. The outer edge of the postorbital spine is convex.

In its median line the carapace carries seven tubercles or spines, of which the fourth, sixth and the seventh are the most pronounced. The first four tubercles are placed in the mesogastric region, the fifth in the urogastric, the sixth in the cardiac and the seventh, which is directed obliquely upward and posteriorly, is in the intestinal region. The sixth median tubercle is sometimes followed by a small convexity.

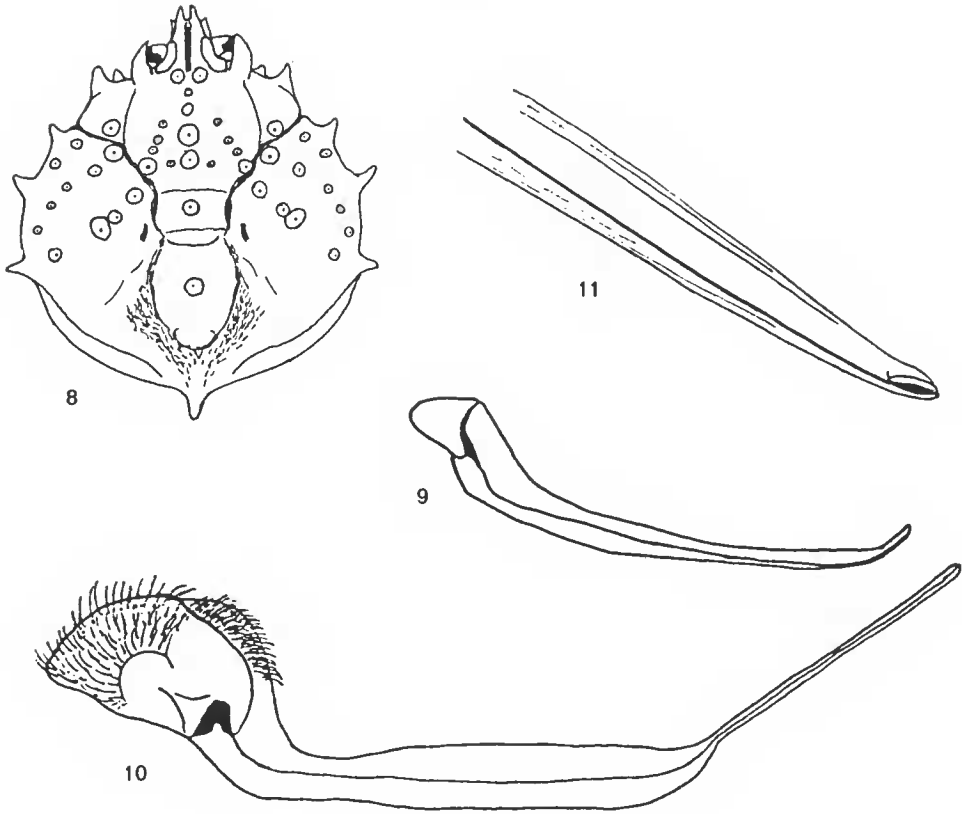


FIG. 8-11. — *Doclea rissonii* Leach : 8, ♂ (locality unknown, RMNH 36154), carapace, dorsal view, 1.25 × ; 9, juvenile ♂ (Sri Lanka (Ceylon), BMNH 1907.5.22.124-128), right first pleopod, 11.5 × ; 10, ♂ (East Coast, Singapore, 1982, RMNH 36158), right first pleopod, 9.5 × ; 11, detail of the tip of the first pleopod of figure 10, 30 ×.

In the posterior part of the frontal region, just before the anterior median tubercle, there is a pair of submedian tubercles. In either protogastric region a longitudinal row of at the utmost four tubercles is present, the two rows diverging posteriorly. The first of these tubercles lies at the same level as the second median tubercle. The last is largest and placed at a level somewhat posterior of the third median tubercle. The metagastric region shows a very small tubercle at either end of the anterior margin. The hepatic region carries a single tubercle. Either inner anterior part of the branchial region has eleven tubercles forming three rows of respectively 2, 5 and 4 tubercles. The first (the outer) of these rows curves towards the penultimate anterolateral spine. The other two rows start in the anterior part of the branchial region and curve towards the last anterolateral spine. The third (the inner) branchial row lies in a direct line with the protogastric row.

The anterolateral border of the carapace is armed with four tubercles or spines. The first and the fourth are slightly more prominent than the second and third. A small

tubercle, up to half as long as the first anterolateral spine, is sometimes placed at the edge of the pterygostomial region.

The posterior spine of the basal antennal segment is very small. There is no pterygostomial canal.

In the adult male the chelae are swollen and almost three quarters as long as the carapace. In the female the chelae have less than half the carapace length. The ambulatory legs of the first pair is  $2\frac{1}{2}$  to 4 times as long as the carapace. The ambulatory legs are long and slender and the dense pile extends from the base to the proximal part of the propodus. The dactylus is often purple in colour.

In the male all abdominal segments are separate. The second abdominal segment has a small median spine, while the third segment has a rounded convexity near the lateral edges of the segment. In the female the abdominal segments are also separate. The second abdominal segment has a small median tubercle, while the third segment has a low median prominence.

In the male two strong submedian spines are present on the fourth thoracic somite, just before the seventh abdominal segment when the abdomen is in the normal position against the thorax.

The first pleopod of the male, when fully mature, is well chitinized and circular in transverse section. It is smooth, the basal half is straight; the distal half is much narrower than the basal part, it is also straight, but directed obliquely outward.

#### REMARKS

*Doclea gracilipes* was distinguished from *D. rissonii* by STIMPSON (1907) by having the last anterolateral spines longer. DE MAN (1888) also distinguished his *D. andersoni* on the same character from *D. rissonii* and mentioned that ANDERSON had examined the type specimen of *D. rissonii*, who reported it having three anterolateral spines. The holotype specimen of *D. rissonii*, which I could examine, has the carapace somewhat deformed due to its preservation as a dry specimen. It does have four (not three) anterolateral spines. In *Doclea* the size of the tubercles and spines changes considerably with the maturity or age of the animals; in juveniles the spines as a rule are relatively (and often absolutely) longer than in larger specimens. The differences in spine length as described for *D. rissonii*, *D. gracilipes* and *D. andersoni*, fit very well in this picture, and in themselves are not sufficient to assign these specimens to different taxa.

DAI (1981) described a new species *D. sinensis* from China. In her description she indicated the close resemblance of *D. sinensis* to *D. gracilipes* and *D. andersoni*. She mentioned the following differences between *D. gracilipes* and *D. sinensis*; both the last anterolateral and the intestinal spine are longer in *D. sinensis* than in *D. gracilipes*; in *D. sinensis* the first pair of ambulatory legs is 3 times as long as the carapace, in *D. gracilipes* this is  $2\frac{1}{2}$  times. As to the first difference, this is not borne out by comparison of STIMPSON's figure (1907: pl. 1 fig. 1) with that of DAI (pl. 1 fig. 1) as in the latter the spines are shown shorter as in STIMPSON's plate. The differences between *D. sinensis* and *D. andersoni* are the following: there are 4 to 5 protuberances in the median line of the carapace in *D. sinensis*, instead of 2 as in *D. andersoni*; the fourth thoracic somite of the male of *D. sinensis* shows an acute ventral spine, in *D. andersoni* this spine is reduced or absent.

The characters that according to DAI distinguish *D. sinensis* (length 36.8 mm, width 34.8 mm (unknown whether measured with or without spines)) on the one hand from *D. gracilipes* (length 23 mm, width 23.5 mm (including spines)) and *D. andersoni* (length 29 mm, width 30 mm (excluded rostrum and spines)) on the other fall within the range of variation of the characters of *D. rissonii*. Depending on size and maturity the length of the legs and spines changes as already mentioned above. Furthermore sometimes short spines or tubercles may be completely hidden from view by the dense pubescence. In specimens in which the pubescence is intact usually only the fourth and sixth of the mediodorsal spines of the carapace are visible. Denudation of the carapace then will show the other spines. The figure of the first male pleopod given by DAI shows a shape characteristic of the gonopod of *D. rissonii*. There can be little doubt therefore that *D. sinensis* has to be treated as a junior synonym of *D. rissonii*.

The figured specimen in SEBA's Thesaurus (SEBA, 1759, and GUÉRIN-MÉNEVILLE, 1827-1828) is without any doubt *D. rissonii*. The rostrum of SEBA's specimen, namely reaches distinctly beyond the spines of the epistome on the anterolateral angle of the buccal frame, and also in other characters resembles *D. rissonii*, so that its identity is beyond doubt. BLEEKER's (1856) *Doclea sebae* was partly based on SEBA's figure, and part of the syntype series thus is *D. rissonii*. BLEEKER's own material, from which a lectotype is selected, proved to belong to *D. brachyrhynchos* (see there p. 926).

HABITAT. — The animals live on soft muddy bottoms and have been reported from depths between a few meters and 33 meters.

#### DISTRIBUTION

This species is known from Sri Lanka (Ceylon), India, Burma, Mergui Archipelago, Malaysia, Singapore, Hong Kong and China. The species is now reported for the first time from Java, Indonesia.

The records of the species in the literature are the following : Trincomalee, Gulf of Manaar, Sri Lanka (Ceylon) (LAURIE, 1906) ; off Piroton Island, Gulf of Kutch, India (CHANDY, 1973) ; Bombay, Maharashtra, India (CHHAPGAR, 1957 ; SANKOLLI & SHENOY, 1975) ; Orissa coast, India (CHOPRA, 1935) ; Sandheads, India (ALCOCK, 1895 ; CHOPRA, 1935) ; River Hooghly, India (ALCOCK, 1895 ; CHOPRA, 1935) ; Sullivan Island, Mergui Archipelago (DE MAN, 1888 ; ALCOCK, 1895 ; CHOPRA, 1935) ; Andaman Islands (ALCOCK, 1895 ; CHOPRA, 1935) ; Gulf of Martaban, Burma (CHOPRA, 1935) ; Pulo Penang, Malay Peninsula (GRIFFIN & TRANTER, 1986) ; Singapore (GRIFFIN & TRANTER, 1986) ; East Coast Park, Singapore (YANG, 1979) ; Indonesian Archipelago (GRIFFIN & TRANTER, 1986) ; Can Tho, Vietnam (YANG, 1979) ; Hong Kong (STIMPSON, 1857, 1907 ; ALCOCK, 1895 ; GEE, 1925 ; CHOPRA, 1935) ; Amoy, China (SHEN, 1940) ; Xiamen (Amoy), Fujian, China (DAI, 1981) ; Beihai, Guangxi, China (DAI, 1981) ; Yinggehai, Hianan Island, Guangdong, China (DAI, 1981).

#### 4. *Doclea armata* De Haan, 1839

(Figs. 12-15 ; pl. IV, V)

*Doclea armata* De Haan, 1839 : pl. G.

*Doclea calcitrata* White, 1847 : 4 (nomen nudum). — WHITE, 1847a : 61. — ADAMS & WHITE, 1848 : 7. — ORTMANN, 1893 : 48. — ESTAMPADOR, 1937 : 552. — ESTAMPADOR, 1959 : 112. — GRIFFIN, 1974 : 10. — GRIFFIN, 1976 : 218. — GRIFFIN & TRANTER, 1986 : 113.

*Doclea tetraptera* A. O. Walker, 1887 : 114, pl. 6 figs. 4-8. — ALCOCK, 1895 (Reprinted in 1968, Amsterdam) : 231. — RATHBUN, 1910 : 318. — CHOPRA, 1935 : 471, text-fig. 1d. — SUVATTI, 1938 : 59. — SUVATTI, 1950 : 149. — BUITENDIJK, 1950a : 66. — DAWYDOFF, 1952 : 139. — (OW-YANG, 1963 : 182, pl. 37 figs. A-B). — YANG, 1979 : 7. — LOVETT, 1981 : 119, 120 fig. 258.

##### MATERIAL EXAMINED

Andaman Sea, south of Rangoon ; 15°14' N-95°51' E ; 29-33 m ; trawl ; 31 March 1963 ; « Anton Bruun » ; sta. 41a ; USNM 135123 (part) : 5 ambulatory legs.

Batu Maung, Penang, Malaysia ; 5°17' N-100°17' E ; 16 January 1983 ; L. B. HOLTHUIS & WONG TAT MENG ; RMNH 36004 : 6 ♂, 1 ♀.

Singapore ; C. J. SAUNDERS ; STEBBING coll. ; BMNH 1928.12.1.172-174 : 3 ♀. — Serg. Maj. ARCHER ; don. Nehley Hospital Museum ; BMNH 1908.12.8.30-31 : 1 juv. ♂, 1 juv. ♀ (? syntypes *Doclea tetraptera* A. O. Walker).

Siglap, Singapore ; July 1934 ; don. Raffles Museum ; RMNH 5392 : 1 ♀.

South China Sea, 150 miles (= 241,35 km) from Singapore ; 28 August 1983 ; H. HUAT ; don. University Singapore ; RMNH 36157 : 1 ♂, 1 ♀.

Padang, Sumatra, Indonesia ; RMNH 3147 : 1 ♂, 1 ♀ ; ? S. MÜLLER ; RMNH 36155 : 1 ♀ (holotype *Doclea armata* De Haan).

Moluccas, Indonesia ; 1895 ; W. A. MOREAU ; RMNH 3148 : 1 ♂.

Off Pattani Bay, Gulf of Thailand, Thailand ; by fishermen ; leg. C. SWENNEN ; 14 November 1985 ; RMNH : 1 ♀.

Koh Samui beach, Sura Thani Province, Thailand ; 2 March 1985 ; L. B. HOLTHUIS & P. NAIYANETR ; RMNH : 4 fragments.

Between Naklua and Sri Racha, Chonburi Province, ca. 150 km southeast of Bangkok, Thailand ; from trawler ; 14 March 1985 ; L. B. HOLTHUIS & A. C. J. BURGERS ; RMNH : 1 ♀.

Sri Racha, Chonburi Province, Gulf of Thailand ; October 1983 ; P. NAIYANETR ; RMNH 36185 : 1 ♂.

4-6 miles (= 6.436-9.654 km) south of Koh Samit, Thailand ; 14-18 fathoms (= 25.60-32.92 m) ; 1 February 1900 ; ZMC : 1 juv. ♂, 2 juv. ♀.

Koh Kahdat ; Thailand ; 5-8 fathoms (= 9.14-14.63 m) ; sandy mud ; 16 February and 4 March 1900 ; Th. MORTENSEN ; ZMC : 1 juv. ♂.

Between Koh Chuen and Koh Chang, Thailand ; 15 fathoms (= 27.43 m) ; mud ; 3 March 1900 ; Th. MORTENSEN ; ZMC : 1 juv. ♂, 1 juv. ♀.

North of Koh Kût, Thailand ; 15 fathoms (= 27.43 m) ; 4 March 1900 ; Th. MORTENSEN ; ZMC : 1 fragment.

Vietnam ; R. SERÈNE ; MP-B 9283 : 1 ♀.

Hong Kong ; in harbour ; W. A. HARLAND ; BMNH 1857.7 : 1 juv. ♂.

Zebu (Cebu), Philippine Islands ; H. CUMING coll. ; BMNH 1843.6 : 1 ♂ (Holotype *Doclea calcitrata* White).

Makassar, 01°11' S-117°06' E ; 21 m ; Corindon II expedition ; sta. CH 201 ; MP-B 16952 : 3 juv. ♂, 1 juv. ♀ ; RMNH 37153 : 1 juv. ♂, 1 juv. ♀. — 01°09' S-117°08' E ; 25 m ; Corindon II expedition ; sta. CH 203 ; MP-B 16954 (part) : 2 juv. ♂, 5 ♀ (4 juv.) ; RMNH 37155 : 2 juv. ♂, 2 juv. ♀. — 01°07.8' S-117°18.7' E ; 49 m ; 30 October 1980 ; Corindon II expedition ; sta. CH 205 ; MP-B 16953 : 2 juv. ♂, 2 juv. ♀ ; RMNH 37154 : 1 juv. ♂, 1 juv. ♀.



### DESCRIPTION

The carapace is more or less rhomboid. The rostrum is incised in the middle for 2 mm at the utmost. Between the incision and the pair of submedian tubercles anterior of the median line the rostrum is not grooved. In adults the tips of the rostrum diverge. There is a broad incision between the orbital margin and the postorbital spine. The outer edge of the postorbital spine is quite straight.

In its median line the carapace carries eight tubercles or spines, of which the last three are the most pronounced. The first four tubercles are placed in the mesogastric region, the fifth in the urogastric, the sixth in the cardiac and the seventh and eighth are in the intestinal region, the eighth directed backward. The seventh median spine is situated on the base of the eighth spine.

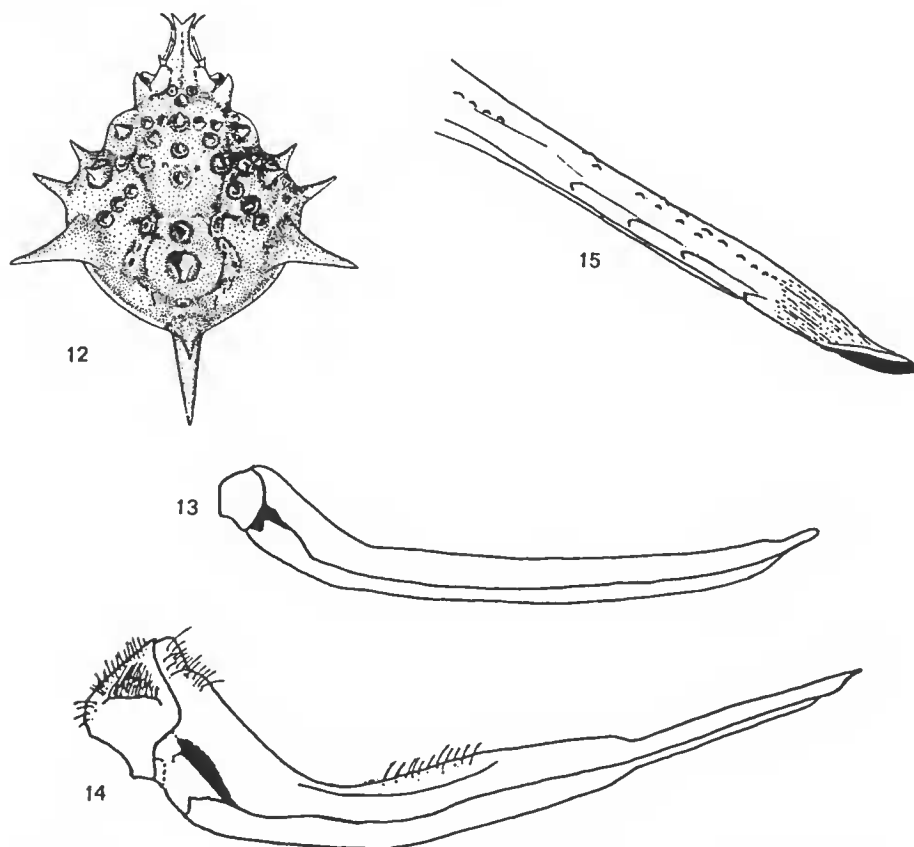


FIG. 12-15. — *Doclea armata* De Haan : 12, ♂ (Siglap, Singapore, July 1934), carapace, dorsal view, 1.2 × (after OW-YANG) ; 13, juvenile ♂ (Koh Kahdat, Thailand, 16 February and 4 March 1900, ZMC), right first pleopod, 11.5 × ; 14, ♂, holotype *D. calcitrata* White (Zebu (Cebu), Philippine Islands, BMNH 1843.6), right first pleopod, 7.5 × ; 15, ♂ (Sri Racha, Chonburi Province, Thailand, October 1983, RMNH 36185), detail of the tip of the right first pleopod, 21.5 ×.

In the posterior part of the frontal region, just before the anterior median tubercle, there is a pair of submedian tubercles. In either protogastric region a longitudinal row of three prominent tubercles is present, the two rows diverging posteriorly. The first of these protogastric tubercles lies at a level slightly behind the second median tubercle. The third tubercle of the row is largest and placed at a level slightly anterior of the fourth median spine. To the outside, on the protogastric region, there is an additional tubercle, which lies somewhat behind the first of the row. The metagastric region shows sometimes a very small tubercle at either end of the anterior margin. The hepatic region carries one huge tubercle. Either inner anterior part of the branchial region has up to nine tubercles, five of these arranged in two parallel rows of respectively two and three tubercles. Two small tubercles are at the base of the second tubercle of the first (outer) row and two closer to the lateral margin of the carapace at the level of the second and third anterolateral spine respectively. The first row of the branchial region starts in the anterior part and curves towards the last anterolateral spine. The second branchial row lies in a direct line with the protogastric row.

The anterolateral border of the carapace is armed with four tubercles or spines. The first anterolateral spine is large and directed obliquely downward, the second to fourth increase in size posteriorly. A minute tubercle is rarely placed just before the first anterolateral spine.

The anterior spine of the basal antennal segment is highly reduced. A pterygostomial canal is present.

In the adult male the chelae are slightly inflated and prominently keeled along the upper and lower border. Their length is about two thirds of that of the carapace. In the female the chelae are half as long as the carapace. The ambulatory legs of the first pair has mostly twice, rarely up to 2 1/2 times the length of the carapace. The ambulatory legs are slender and the dense pile extends from the base to the proximal part of the dactylus and gives the legs a quadrangular shape, because on the four angles the hairs are longer than in between.

In the male the abdominal segments are separate. The second abdominal segment has a median prominence, while the third has median and submedian prominences. In the female the abdominal segments are likewise separate. A median prominence is present on the second abdominal segment and submedian prominences on both the second and fourth abdominal segments.

In the male there are two large submedian spines on the fourth thoracic somite, just before the seventh abdominal segment when the abdomen is in the normal position against the thorax.

The pleopod of the male, when fully mature, is well chitinized and triangular in transverse section. Proximally it is somewhat depressed and bears hairs, the distal part is distinctly compressed. The tip is obtuse and tapers off abruptly.

#### REMARKS

In the crustacea volume of Fauna Japonica, DE HAAN figured the mouth parts of a new species of *Doclea*, which he named *Doclea armata*. Although DE HAAN gave no description of his *D. armata*, the fact that the name was published with a figure, makes it an

available name. DE HAAN's type specimen is still extant in the RMNH. It is preserved dry with the mouthparts, which were figured by DE HAAN, taken out and glued to a small strip of cardboard. The specimen shows without any doubt to belong to the species usually indicated with the names *D. tetraptera* Walker, 1887 or *D. calcitraba* White, 1847. As DE HAAN's name is the oldest, it has precedence over the others and has to be used. The holotype specimen of *D. armata* partly lacks the pile, except for some on some of the ambulatory legs. Where the pile is still present it gives the legs a quadrangular circumference; where it is missing the legs are cylindrical, like in all other *Doclea* species. WALKER's *Doclea tetraptera* is based on young specimens with their pile still present. GRIFFIN (1974 : 10) already relegated *D. tetraptera* into the synonymy of *D. calcitraba*.

HABITAT. — The species lives on muddy and sandy bottoms and is known from depths between a few meters to 33 meters.

#### DISTRIBUTION

This species is known from Sri Lanka (Ceylon), India, Burma, Singapore, Thailand, Hong Kong and the Philippines. The species is now reported for the first time from Malaysia and Vietnam.

The records of the species in the literature are the following : River Hooghly, India (ALCOCK, 1895 ; CHOPRA, 1935) ; Gulf of Martaban, Burma (CHOPRA, 1935) ; North Andaman Sea, Burma (GRIFFIN, 1974) ; Singapore (WALKER, 1887 ; CHOPRA, 1935 ; GRIFFIN, 1974) ; Siglap, Singapore (BUI TENDIJK, 1950a) ; off Changi, Singapore (YANG, 1979) ; Koh Samit, Thailand (RATHBUN, 1910) ; Koh Kahdat, Thailand (RATHBUN, 1910) ; between Koh Chuen and Koh Chang, Thailand (RATHBUN, 1910) ; Koh Kût, Thailand (RATHBUN, 1910) ; Sunda Strait, Indonesia (GRIFFIN & TRANTER, 1986) ; Java Sea, Indonesia (GRIFFIN & TRANTER, 1986) ; Pulo Balu, Java, Indonesia (GRIFFIN & TRANTER, 1986) ; Hong Kong (YANG, 1979) ; Luzon, Philippine Islands (ESTAMPADOR, 1937, 1959) ; Zebu (Cebu), Philippine Islands (WHITE, 1847, 1847a ; ADAMS & WHITE, 1848 ; ESTAMPADOR, 1937, 1959 ; GRIFFIN, 1974) ; Makassar Strait (GRIFFIN & TRANTER, 1986) ; Santubong, Borneo (NOBILI, 1903) ; Jolo Sea, off N. Borneo (GRIFFIN, 1976).

#### 5. *Doclea muricata* (Fabricius, 1787)

(Figs. 16-19 ; pl. V)

*Cancer muricatus* Fabricius, 1787 : 324. — HERBST, 1788 : 211, pl. 14 fig. 83. — PENNANT, 1790-1791 : 116. — FABRICIUS, 1793 : 459.

*Inachus muricatus* ; WEBER, 1795 : 93. — FABRICIUS, 1798 : 335.

*Inachus hybridus* Weber, 1795 : 93 (nomen nudum). — FABRICIUS, 1798 : 335.

*Maia muricata* ; BOSC, 1802 : 255. — DESMAREST, 1830 : 274.

*Maia hybrida* ; BOSC, 1802 : 256. — LATREILLE, 1803 : 99. — DESMAREST, 1830 : 274.

*Phalangipus hybridus* ; LATREILLE, 1828 : 699.

*Doclea hybrida* ; H. MILNE EDWARDS, 1834 : 294. — WHITE, 1847 : 3. — ADAMS & WHITE, 1848 :

7. — BLEEKER, 1856 : 64. — BLEEKER, 1856a : 9. — BLEEKER, 1857 : 9. — DE MAN, 1887 :

9. — HENDERSON, 1893 : 342. — ORTMANN, 1893 : 47. — ALCOCK, 1895 (Reprinted in 1968,

Amsterdam) : 231. — SANKOLLI & SHENOY, 1975 : 126-137, figs. 1a-b-5.

*Doclea muricata* ; H. MILNE EDWARDS, 1834 : 295. — WHITE, 1847 : 4. — ADAMS & WHITE, 1848 : 8. — NAUCK, 1880 : 38. — A. O. WALKER, 1887 : 109. — AURIVILLIUS, 1888-1889 : 43, pl. 4 fig. 5. — ORTMANN, 1893 : 48. — ALCOCK, 1895 (Reprinted in 1968, Amsterdam) : — STEBBING, 1920 : 232. — BARNARD, 1950 : 49, fig. 11a. — (OW-YANG, 1963 : 157). — GUINOT, 1967 : 294. — GRIFFIN, 1974 : 11. — SANKOLLI & SHENOY, 1975 : 126-137, fig. 1c. — LOVETT, 1981 : 121.

*Doclea hybridoides* Bleeker, 1856a : 9. — BLEEKER, 1857 : 9. — ORTMANN, 1893 : 47.  
*Doclea muriata* (sic) ; LOVETT, 1981 : 120 fig. 262.

#### MATERIAL EXAMINED

Galle, Sri Lanka (Ceylon) ; don. W. ONDAATJE and son ; BMNH 82.19 : 1 ♂.  
India ; BMNH 84a, 84b, 84c, 314a : 4 ♂.  
Harbour of Cochin, India ; 12 February 1980 ; J. C. MIQUEL ; RMNH 32740 : 2 ♂, 2 ♀.  
Pondichéry, India ; 8 May 1883 ; M. MAINDRON ; MP-B 12687 : 2 ♂ ; August 1901 ; M. MAINDRON ; MP-B 12665 : 4 ♂, 1 ♀. — L. T. LESCHENAULT DE LA TOUR ; MP-BS 4487 and MP-BS 265 : 2 ♂ ; MP-BS 264 : 1 ♂ ; MP-BS 262 and MP-BS 4486 : 2 ♀ ; BMNH : 1 ♀.  
Madras, India ; J. R. HENDERSON ; BMNH 92.7.15.416-420 : 5 ♂ (4 juv.), 2 ♀ (1 juv.) ; 23 September 1927 ; BMNH : 1 ♂.  
Coromandel, India ; M. v. H. coll. ; ZMA : 2 ♂.  
? Bay of Bengal (possibly Tranquebar), India ; 1790-1793 ; I. K. DALDORFF ; ZMC : 3 ♂, 2 ♀ (lectotype and paralectotypes of *Doclea hybrida* (F.))<sup>1</sup>. — 1790-1793 ; I. K. DALDORFF ; RMNH 36152 : 1 ♂, 1 ♀. — I. K. DALDORFF ; ZMC : 2 ♀. — I. K. DALDORFF ; BANKS coll. ; BMNH : 5 ♂, 1 ♀.  
Indian Ocean ; F. E. GUÉRIN-MÉNEVILLE ; MP-B 12664 : 1 ♀.  
Indonesia ; M. v. H. coll. ; ZMA : 1 ♀.  
Padang, Sumatra, Indonesia ; RMNH 3146 : 2 ♀ ; RMNH 3149 : 1 ♂.  
Semarang, Java, Indonesia ; Kunaraht ; MP-BS 263 : 1 ♂.  
Mollucas, Indonesia ; C. G. C. REINWARDT ; RMNH 36153 : 1 ♂, 1 ♀.  
Locality unknown ; ZMC : 1 ♂, 1 ♀, 1 carapax ; BMNH 315b : 1 ♀ ; ZMA : 1 ♀.

#### DESCRIPTION

The carapace is semi-globular. The rostrum is incised in the middle for 2 mm at the utmost. Between the incision and the pair of submedian tubercles anterior of the median line the rostrum is partly grooved. In adults the tips of the rostrum are directed straight forward. There is a narrow incision between the orbital margin and the postorbital spine. The outer edge of the postorbital spine is a bit convex, almost straight.

In its median line the carapace carries eight tubercles or spines, of which the fourth and the last are most prominent. The first four tubercles are placed in the mesogastric region, the fifth in the urogastric, the sixth in the cardiac and the seventh and eight are in the intestinal region, the eighth directed backward. The sixth median tubercle is followed by a small convexity.

In the posterior part of the frontal region, just before the anterior median tubercle, there is a pair of submedian tubercles. In either protogastric region a longitudinal row of four tubercles is present, the two rows diverging posteriorly. The first of the four tubercles lies at the same level as the second median tubercle. The last tubercle of the row is largest and placed at a level between the third and fourth median tubercle. To the outside, at the same level as the first submedian tubercle, there is another tubercle. The metagastric

1. Specimens not seen personally, but studied from photographs.

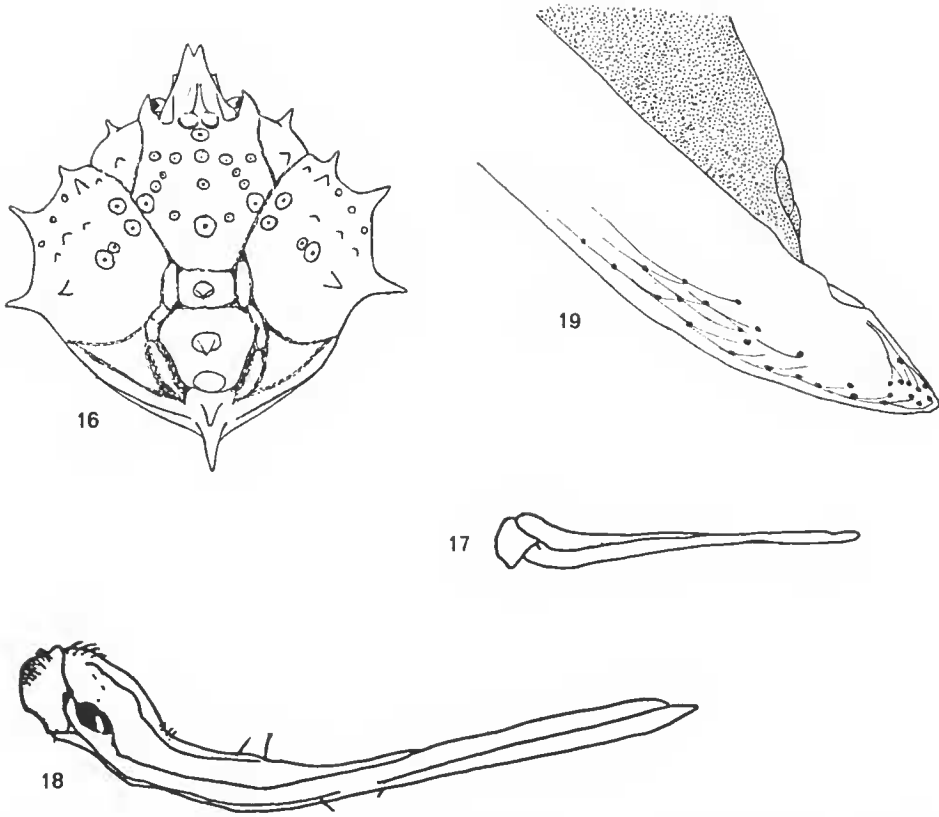


FIG. 16-19. — *Doclea muricata* (F.) : 16, ♀ (? Bay of Bengal (possibly Tranquebar), India, 1790-1793, BMNH (BANKS coll.)), carapace, dorsal view, 1.5 × ; 17, juvenile ♂ (Padang, Sumatra, Indonesia, RMNH 3149), right first pleopod, 6 × ; 18, ♂ (Madras, India, BMNH 92.7.15.416-420), right first pleopod, 7.5 × ; 19, ♂ (Pondichéry, India, August 1901, MP-B 12665), detail of the tip of the right first pleopod, 50.5 ×.

region shows a small tubercle at either end of the anterior margin. The hepatic region carries only one tubercle. Either inner anterior part of the branchial region has thirteen tubercles forming three rows of respectively 5, 4 and 4 tubercles. The first two (outer) rows of the branchial region curve towards the last anterolateral spine ; the third (inner) row starts in the anterior part and curves past the last anterolateral spine. The second and third tubercle of latter row are placed next to each other. The third branchial row lies in a direct line with the protogastric row.

The anterolateral border of the carapace is armed with four tubercles or spines. The first is more prominent than the second and third, which are of equal size and the fourth is the most prominent. A tubercle up to one third as long as the first anterolateral spine, is sometimes placed just before the anterolateral spine.

The posterior spine of the basal antennal segment is smaller than the anterior. There is no pterygostomial canal.

In the adult male the chelae are swollen and are more than three quarters as long as the carapace. In the female the chelae are half as long as the carapace. The ambulatory legs of the first pair has 2-2 1/2 times the length of the carapace. The ambulatory legs are long and slender and the dense pile extends from the base to the proximal part of the dactylus.

In the male the abdominal segments 4, 5 and 6 are coalesced. The second abdominal segment has a low median prominence. In the female the abdominal segments 4, 5 and 6 are also coalesced. The second abdominal segment has a low median prominence, while the third segment has additional pronounced transverse ridges on either side of the median line.

In the male there are two strong submedian spines on the fourth thoracic somite, just before the seventh abdominal segment when the abdomen is in the normal position against the thorax.

The first pleopod of the male, when fully mature, is well chitinized and triangular in transverse section. It is smooth, slightly bent and tapers gradually to a rather sharp point. A row of small hairs is present at the inner and outer border of the appendage.

#### REMARKS

ALCOCK (1895) already stated that the species that was known under the name *D. muricata* probably was based on nothing more than the younger specimens of what was known as *D. hybrida*. The only characters to distinguish the two species were that *D. hybrida* was larger, with the chelipeds larger in respect to the length of the carapace and that *D. muricata* had better developed spines.

Examination of my rather extensive material showed that most specimens that on account of their spine-length should be (and often were) assigned to *D. muricata* did not have completely developed and well chitinized male gonopods. In those in which the gonopods are well developed, shown them indistinguishable from those of *D. hybrida*. The difference that SANKOLLI & SHENOY (1975) found between the first male pleopods of *D. muricata* and *D. hybrida* possibly are the result of the preservation of their material. In dried immature specimens the deformation of the not yet fully chitinized parts of the gonopod can be considerable. I have observed that in adults the position of the distal part of the gonopod in respect to the proximal portion varies considerably due to a stronger or less strong torsion of the gonopod.

From the syntype series of *D. hybrida* a lectotype is selected, because it comprises two species. One of the syntypes is *D. ovis* and is in the RMNH. The specimen selected as lectotype of *D. hybrida* is kept in the ZMC and is labelled "*Inachus hybridus* ♂ ad Ind. or. Daldorf" (on small label : "*Doclea muricata* Herbst").

Although the holotype specimen of *D. hybridoides* Bleeker seems to be lost, the description leaves no doubt about the identity of the species with *D. muricata*.

HABITAT. — The species evidently occurs in rather shallow water, the only definite depth recorded is 34 fathoms (= 62.18 m).

#### DISTRIBUTION

The species seems to be restricted to the Indian Ocean. It is known from South Africa, India, Malaysia and Indonesia.

The records of the species in the literature are the following : Delagoa Bay, Cape Province, South Africa (BARNARD, 1950) ; off Point Shepstone, Natal, South Africa (STEBBING, 1920 ; BARNARD, 1950) ; East India (probably Tranquebar) (FABRICIUS, 1787, 1793, 1798 ; HERBST, 1788 ; LATREILLE, 1803 ; DESMAREST, 1830) ; Coromandel coast, India (H. MILNE EDWARDS, 1834 ; DE MAN, 1887 ; HENDERSON, 1893) ; Pámban, Rameswaram, India (THURSTON, 1895) ; Madras, India (HENDERSON, 1893) ; Ratnagiri, Maharashtra, India (SANKOLLI & SHENOY, 1975) ; Bay of Bengal (GRIFFIN, 1974) ; Gulf of Martaban, Burma (HENDERSON, 1893) ; Sullivan Island, Mergui Archipelago (DE MAN, 1887) ; Sibolga (= Sibogha), Sumatra, Indonesia (BLEEKER, 1856a, 1857) ; Ambon, Indonesia (BLEEKER, 1856, 1856a, 1857).

#### 6. *Doclea johnsoni* Lovett, 1981

(Fig. 20)

*Doclea johnsoni* (OW-YANG, 1963 : 178, pl. 35 fig. A). — LOVETT, 1981 : 120 fig. 261, 121.

#### MATERIAL EXAMINED

Tanjong Stapa, Malaysia ; 6-7 fathoms (= 10.97-12.80 m) ; mud ; Fisheries Research Collection B 77 ; NMS AC 15/82/55 : 1 ♀ (holotype).

#### DESCRIPTION

The carapace is semi-globular. The rostrum is incised in the middle for 1.5 mm. Between incision and the pair of submedian tubercles anterior of the median line the rostrum is partly grooved. The tips of the rostrum are directed forward. There is a relatively broad incision between the orbital margin and the postorbital spine. The outer edge of the postorbital spine is convex.

In its median line the carapace carries nine tubercles or spines, of which the last two are the most pronounced. The first four tubercles are placed in the mesogastric region, the fifth in the urogastric, the sixth and seventh in the cardiac and the eighth and ninth are in the intestinal region, the ninth directed backward.

In the posterior part of the frontal region, just before the anterior median tubercle, there is a pair of submedian tubercles. In either protogastric region a longitudinal row of four tubercles is present, the two rows diverging posteriorly. The first of these tubercles lies at the same level as the second median tubercle. The last one of the row is largest and placed at a level halfway the third and fourth median tubercle. To the outside, at the same level as the latter submedian tubercle is, there is another tubercle. The metagastric region shows a small tubercle at either end of the anterior margin. The hepatic region car-

ries two tubercles. Either inner anterior part of the branchial region has ten tubercles forming three rows of respectively 4, 2 and 4 tubercles. The first two rows of the branchial region curve towards the last anterolateral spine; the third row of the branchial region starts in the anterior part and curves past the last anterolateral spine. The third branchial row lies in a direct line with the protogastric row.

The anterolateral border of the carapace is armed with four tubercles or spines. The first spine is the smallest, the second to fourth increase in size posteriorly. A tubercle, up to one fifth as long as the first anterolateral spine is observed just before the first anterolateral spine.

The posterior spine of the basal antennal segment is very small. There is a pterygostomial canal present.

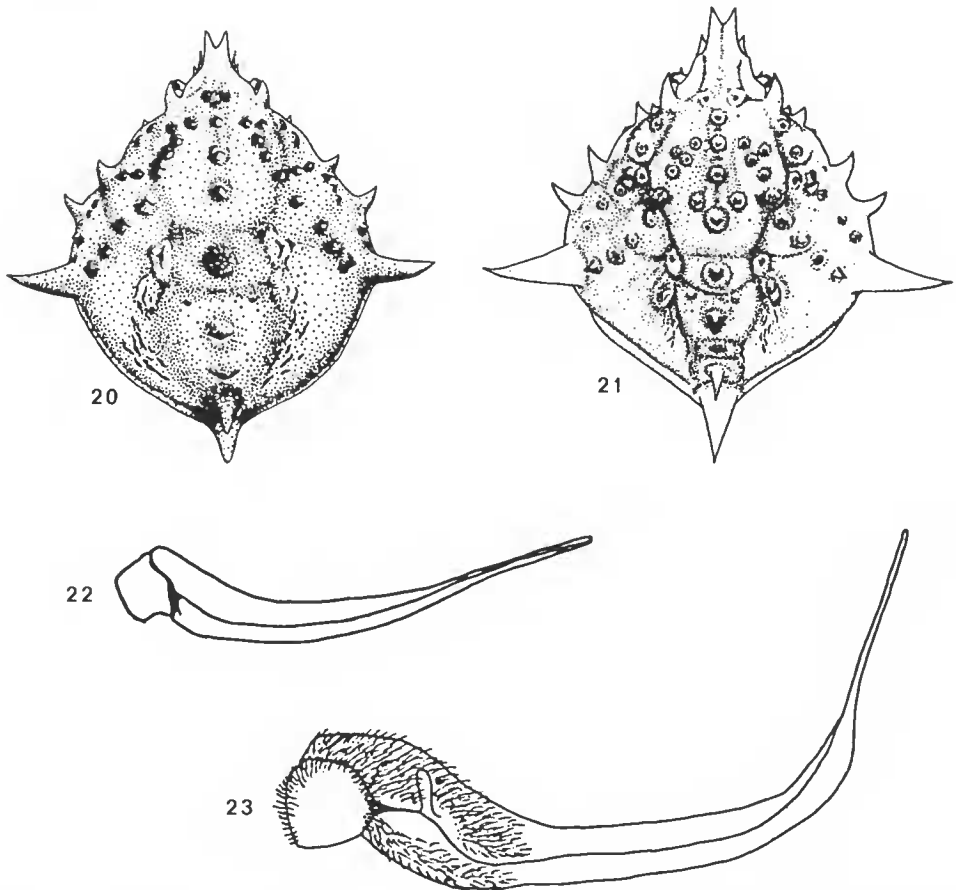


FIG. 20-23. — *Doclea johnsoni* Lovett : 20, ♀, holotype (Tanjong Stapa, Malaysia, NMS AC 15/82/55), carapace, dorsal view, 1.4 × (after OW-YANG). — *Doclea canaliformis* Lovett : 21, ♂, lectotype (Siglap, Singapore, June 1934, NMS), carapace, dorsal view, 1.75 × (after OW-YANG); 22, juvenile ♂, paralectotype (Port Swettenham, west coast Malaysian Peninsula, NMS 1965.10.14.31-32), right first pleopod, 11.5 ×; 23, ♂ (Siglap, Singapore, June 1934, RMNH 5386), right first pleopod, 9.5 ×.



In the female specimen the chelae have less than half the length of the carapace. The ambulatory legs of the first pair is a bit more than twice the carapace length. The ambulatory legs are long and slender and the dense pile extends from the base to the proximal part of the dactylus.

In the female specimen the abdominal segments are separate. The second and third abdominal segments have median and smaller submedian prominences.

#### REMARKS

The specimen that was at my disposal is the only known specimen so far reported. It very closely resembles *D. muricata*, but can be distinguished by having : (1) a more prominent convexity behind the sixth median spine, which thus forms the seventh median spine ; (2) one hepatic tubercle more ; (3) three branchial tubercles less ; (4) a pterygostomial canal ; and (5) having the abdominal segments 4, 5 and 6 free.

**HABITAT.** — The only specimen known was found at 6-7 fathoms (= 10.97-12.80 m) depth on a muddy bottom.

**DISTRIBUTION.** — Only known from the type-locality : Tanjong Stapa, Malaysia.

### 7. *Doclea canaliformis* Lovett, 1981

(Figs. 21-23 ; pl. VI)

*Doclea canalifera*, DE MAN, 1895 : 486, pl. 12 figs. 1, 1a-b. — BUITENDIJK, 1950a : 65. [Not *D. canalifera* Stimpson, 1857.]

*Doclea muricata* ; LANCHESTER, 1900 : 722 (part). [Not *D. muricata* (Fabricius, 1787).]

*Doclea canaliformis* ; (OW-YANG, 1963 : 173, pl. 34 figs. A-C). — LOVETT, 1981 : 120 fig. 260, 121.

*Doclea simeti* Griffin & Tranter, 1986 : 115, fig. 34c, pl. 10.

#### MATERIAL EXAMINED

Port Swettenham, west coast Malaysian Peninsula ; NMS 1965.10.14.31-32 : 1 juv. ♂, 1 juv. ♀ (paralectotypes) ; December 1934 ; don. Raffles Museum ; RMNH 36186 : 1 juv. ♀.

Malacca ; 1-2 feet (= 0.30-0.61 m) ; mud ; F. P. BEDFORD & W. F. LANCHESTER ; BMNH 1900.:0. 22.10 (part) : 1 juv. ♀.

Siglap, Singapore ; June 1934 ; NMS : 1 ♂, 1 ♀ (lectotype and paralectotype) ; RMNH 5386 : 1 ♂.

#### DESCRIPTION

The carapace is more or less rhomboid. The rostrum is incised in the middle for 1.5 mm at the utmost. Between the incision and the pair of submedian tubercles anterior of the median line the rostrum is clearly grooved. In adults the tips of the rostrum are slightly diverging. There is a narrow incision between the orbital margin and the postorbital spine. The outer edge of the postorbital spine is convex.

In its median line the carapace carries eight tubercles or spines, of which the last two are most pronounced. The first four tubercles are placed in the mesogastric region, the

fifth in the urogastric, the sixth in the cardiac and the seventh and eighth are in the intestinal region, the eighth is directed upwards and backward.

In the posterior part of the frontal region, just before the anterior median tubercle, there is a pair of submedian tubercles. In either protogastric region a longitudinal row of four tubercles is present, the two rows diverging posteriorly. The first of these tubercles lies at the same level as the second median tubercle. The last tubercle of the row is largest and placed at a level halfway the third and fourth median tubercle. To the outside, at a level more anterior of the second median tubercle, there is another tubercle. The metagastric region shows a large conspicuous tubercle at either end of the anterior margin. The hepatic region carries two or three tubercles. Either inner anterior part of the branchial region has seven tubercles forming two rows of respectively 3 and 4 tubercles. The first row of the branchial region curves towards the last anterolateral spine. The second row of the branchial region starts in the anterior part and curves past the last anterolateral spine and lies in a direct line with the protogastric row.

The anterolateral border of the carapace is armed with four tubercles or spines. The first three anterolateral spines are of about equal size and the fourth is somewhat larger. A tubercle, up to one third as long as the first anterolateral spine, is sometimes placed just before the first anterolateral spine.

The posterior spine of the basal antennal segment is smaller than the anterior one. There is a pterygostomial canal present.

In the adult male the chelae are swollen and, when fully mature, probably more than half as long as the carapace. In the female the chelae have less than half the carapace length. The ambulatory legs of the first pair is 2 to 2 1/2 times the carapace length. All ambulatory legs are long and slender and the dense pile extends from the base to the proximal part of the dactylus.

In the adult male the abdominal segments are separate. The second abdominal segment has a small median prominence, while the third abdominal segment has submedian prominences. In the female the abdominal segments are also separate. The second abdominal segment has a median prominence and both the second and third abdominal segments have submedian prominences.

There are in the male four submedian spines on the fourth thoracic somite just before the seventh abdominal segment when the abdomen is in the normal position against the thorax. The anterior pair is smaller and is situated less submedian as the posterior pair.

The first pleopod of the male, when fully mature, is well chitinized and circular in transverse section. It is smooth, the basal half is slightly bent ; the distal half is much narrower than the basal part is, it is straight. The distal part makes an angle with the proximal part.

#### REMARKS

This species closely resembles young *D. ovis*, but can be easily distinguished by the presence of : (1) two intestinal spines (instead of one) ; (2) two or three hepatic tubercles (instead of one) ; and (3) four sternal spines in the male (instead of two). The species also shows a strong resemblance to *D. muricata*, but can be distinguished from latter species by

the presence of (1) a pterygostomial canal ; (2) two or three hepatic tubercles (instead of one) ; (3) only seven branchial tubercles and (4) of free abdominal segments.

BUITENDIJK (1950a) saw all material from Siglap, of which she kept one specimen for the RMNH. All other became type material of a new species when OW-YANG studied it.

Of the original type series on which OW-YANG's description of *D. canaliformis* is based only the type specimens at my disposal are in the NMS. All these specimens are syntypes, because LOVETT used the keys of OW-YANG's thesis for his publication and did not designate a holotype. Because I only have seen a part of the original type series and OW-YANG's material included several juveniles it seems necessary to me to designate a lectotype to avoid confusion in future. The male specimen at my disposal from Siglap, Singapore is here selected as lectotype.

GRIFFIN & TRANTER, unaware of the publication by LOVETT, describe *Doclea simeti*, based on three specimens from Tsimei, China. Although these specimens were not examined by me, the description and figures of specimen and gonopod leave no doubt that we have to deal here with *D. canaliformis*. Therefore *D. simeti* must be considered a junior synonym of *D. canaliformis*.

**HABITAT.** — The species lives on soft muddy and sandy bottoms.

#### DISTRIBUTION

The species is only known from Malaysia, Malacca, Singapore and China.

The records of the species in the literature are the following : Malacca (LANCHESTER, 1900) ; Port Swettenham, Selangor (BUITENDIJK, 1950a) ; Siglap, Singapore (BUITENDIJK, 1950a) ; Java Sea, Indonesia (DE MAN, 1895) ; Tsimei, China (GRIFFIN & TRANTER, 1986).

### 8. *Doclea alcocki* Laurie, 1906

(Figs. 24-26 ; pl. VII)

*Doclea alcocki* Laurie, 1906 : 381, pl. 2 fig. 2. — NATHEEWATHANA *et al.*, 1981 : 52. — GRIFFIN & TRANTER, 1986 : 113, figs. 34d-e.

#### MATERIAL EXAMINED

Sri Lanka (Ceylon) ; don. Colombo Museum ; MP-B 12681 : 1 ♂.

Pearl Banks, Gulf of Manaar, Sri Lanka (Ceylon) ; W. A. HERDMAN ; BMNH 1907.5.22.129 : 1 ♀ (holotype).

#### DESCRIPTION

The carapace is sub-pyriform. The rostrum is incised in the middle for 4 mm at the utmost. Between the incision and the pair of submedian tubercles anterior of the median line the rostrum is clearly grooved. In adults the tips of the rostrum are straight and pointed. The upper orbital margin has anteriorly and posteriorly a sharp pointed spinule. There is a narrow incision between the orbital margin and the postorbital spine. The outer edge of the postorbital spine is almost straight.

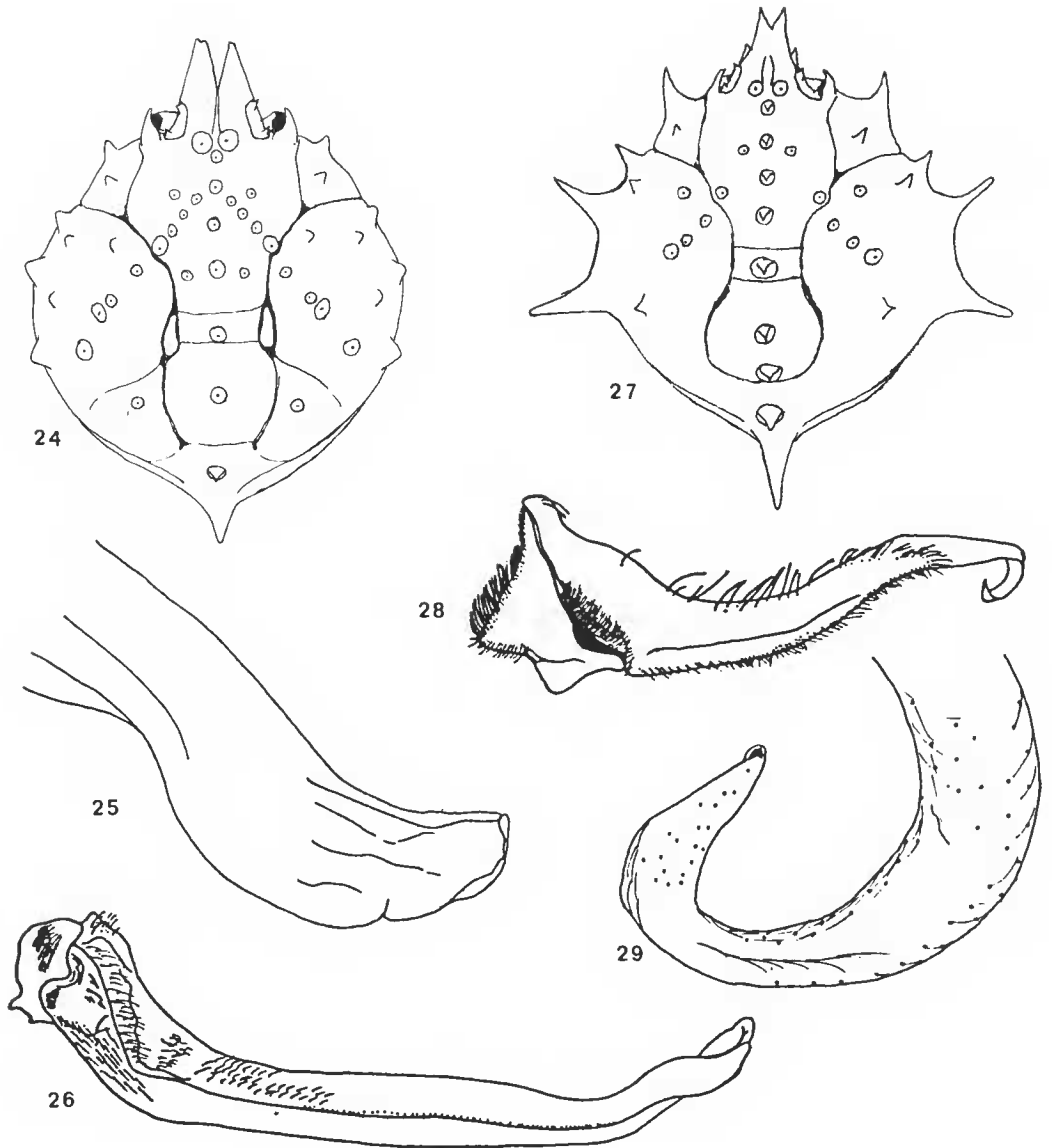


FIG. 24-29. — *Doclea alcocki* Laurie : 24, ♂ (Sri Lanka (Ceylon), MP-B 12681), carapace, dorsal view, 1.13 × ; 25, detail of the tip of the right first pleopod of the male of figure 24, 21.5 × ; 26, right first pleopod of the male of figure 24, 4.5 × . — *Doclea aduncus* n. sp. : 27, ♀, paratype (Manora, near Karachi, Pakistan, 7 June 1977, RMNH 36242), carapace, dorsal view, 1.24 × ; 28, ♂, holotype (Fish Harbour, Karachi, Pakistan, 30 January 1984, RMNH 36241), right first pleopod, 6 × ; 29, detail of the tip of the first pleopod of figure 28, 37.5 × .

In its median line the carapace carries eight tubercles or spines, of which the last two are the most pronounced. The first four are placed in the mesogastric region, the fifth in the urogastric, the sixth in the cardiac and the seventh and eighth are in the intestinal region, the seventh directed upward and the eighth directed obliquely downward. The female holotype has on the base of the last spine two small spines, of which the right one is smallest. The sixth median spine is followed by a rounded convexity.

In the posterior part of the frontal region, just before the anterior median tubercle, there is a pair of submedian tubercles. In either protogastric region a longitudinal row of two to four tubercles is present, the two rows diverging posteriorly. The first of these tubercles lies at a level halfway the second and third median tubercle. The last tubercle of the row is a big flat tubercle and placed at a level slightly before the fourth median tubercle. To the outside, at a level behind of the second median tubercle, but somewhat before as the first tubercle of the protogastric row, there is a single tubercle present. The metagastric region shows a large and blunt tubercle at either end of the anterior margin. The hepatic region carries only one tubercle. Either inner anterior part of the branchial region has seven tubercles of which two rows of respectively 2 and 4 tubercles. The first (inner) row of the branchial region curves towards the last anterolateral spine. A single tubercle is placed at the anterior edge of the branchial region, between the first and second row. The second row of the branchial region starts in the anterior part and curves towards a position more dorsally, but at the same level as the last anterolateral spine. This branchial row lies in a direct line with the protogastric row. There is a tubercle present in the metabranchial region.

The anterolateral border of the carapace is armed with four tubercles or spines. The first spine is the largest, the second and third are of equal size and the fourth is a broad, but blunt, tubercle. A tubercle that is sometimes placed just before the first anterolateral spine is not observed.

The posterior spine of the basal antennal segment is highly reduced. There is no pterygostomial canal.

In the adult male the chelae are globose and more than half as long as the carapace. In the female the chelae have less than half the carapace length. The ambulatory legs of the first pair is almost of the same length as the length of the carapace. The ambulatory legs are short and thick and the dense pile extends from the base to the distal part of the propodus.

In the male the abdominal segments are strongly rounded and clearly separate. The second abdominal segment has a median prominence, while the third abdominal segment has submedian prominences. In the female the abdominal segments are also separate. On the second abdominal segment a median prominence with a spinule can be observed, and the third and fourth abdominal segments have submedian pronounced ridges.

There are in the male no submedian spines, but a keeled ridge on the fourth thoracic somite, just before the seventh abdominal segment when the abdomen is in the normal position against the thorax.

The first pleopod of the male, when fully mature, is well chitinized and flattened in transverse section. It is smooth, stout, is proximally slightly and distally strongly bent, followed by a falcate flat lobed tip.

#### DISTRIBUTION

Only known from Sri Lanka (Ceylon) and Thailand.

The record of the species in the literature is the following : Pearl Banks, Gulf of Manaar, Sri Lanka (Ceylon) (Laurie, 1906 ; GRIFFIN & TRANTER, 1986) ; Thailand (NATHEEWATHANA *et al.*, 1981).

#### 9. *Doclea aduncus* n. sp.

(Figs. 27-29 ; pl. VIII)

#### MATERIAL EXAMINED

Fish Harbour, Karachi, Pakistan ; 30 January 1984 ; don. University of Karachi ; RMNH 36241 : 1 ♂ (holotype) ; 30 October 1966 ; UKK : 1 ♀ (paratype).

Manora, near Karachi, Pakistan ; 7 June 1977 ; don. University of Karachi ; RMNH 36242 : 1 ♀ (paratype) ; 7 June 1977 ; UKK : 1 juv. ♂ (paratype).

#### DESCRIPTION

The carapace is globular. The rostrum is incised in the middle for 2.5 mm at the utmost. Between the incision and the pair of submedian tubercles anterior of the median line the rostrum is partly grooved. In adults the tips of the rostrum are straight and sharply pointed. The orbitals have anteriorly and posteriorly a sharp pointed spinule on the upper margin. There is a narrow incision between the orbital margin and the postorbital spine. The outer edge of the postorbital spine is convex.

In its median line the carapace carries eight tubercles or spines, of which the last three are most pronounced. The first four spines are placed in the mesogastric region, the fifth in the urogastric, the sixth in the cardiac and the seventh and eighth are in the intestinal region, the eighth directed backward. The tips of all median spines are directed oblique upward. The sixth median spine is followed by a rounded convexity.

In the posterior part of the frontal region, just before the anterior median spine, there is a pair of submedian tubercles. In either protogastric region a longitudinal row of three tubercles is present, the two rows diverging posteriorly. The first of these tubercles, the most prominent one, lies at a level slightly behind the second median tubercle. The last one is placed at a level slightly before the third median tubercle. The tubercle at either end of the anterior margin of the metagastric region is absent. The hepatic region carries only one tubercle. Either inner anterior part of the branchial region has six tubercles, of which one row of three tubercles. This row curves towards the last anterolateral spine. One tubercle is placed more submedian than the branchial row of tubercles and at a level between the third and fourth median spine. At a line between the hepatic and the last anterolateral spine there is another tubercle. The sixth branchial tubercle or spine is at a level slightly before the sixth median and somewhat past the last anterolateral spine. The branchial row lies in a direct line with the protogastric row.

The anterolateral border of the carapace is armed with four tubercles or spines. The second spine is the smallest, the third is somewhat larger than the first and the fourth spine is largest. A tubercle, which is sometimes placed just before the first anterolateral spine is not observed in all specimens that I had at my disposal.

The posterior spine of the basal antennal segment is very minute. There is a pterygostomial canal present.

In the adult male the chelae are probably, when fully mature, globose and more than half as long as the carapace. In the female the chelae have slightly more than half the carapace length. The ambulatory legs of the first pair is 2 to 2 1/2 times the length of the carapace. The ambulatory legs are long and slender and the dense pile extends from the base to the distal part of the carpus.

In the male the abdominal segments are separate. The first two abdominal segments have median prominences, the third one submedian prominences. In the female the abdominal segments 4, 5 and 6 are coalesced. The first two abdominal segments have median prominences, the third and fourth ones have more or less submedian prominences.

There are in the male no submedian spines, but there is a faint keeled ridge present on the fourth thoracic somite, just before the seventh abdominal segment when the abdomen is in the normal position against the thorax.

The first pleopod of the male, when fully mature, is well chitinized and round to oval in transverse section. It is smooth, slender and has a posterodorsally curved distal portion.

ETYMOLOGY. — The name means “hook that is bent inward” and is chosen to be descriptive for the first male pleopod.

#### REMARKS

The species can be easily distinguished from all other species, except *D. alcocki*, by the absence of sternal spines or tubercles on the thoracic sternum of the male. The female can be distinguished from any other species of *Doclea*, by having the genital opening on the posterior side of the genital prominence. In all other *Doclea* species the female genital opening is on the anterior side or on the inward directed side of the genital prominence. The species can be distinguished from *D. alcocki* by : (1) the absence of a metabranchial tubercle ; (2) the tubercles that are less blunt and broad ; (3) the female abdominal segments 4, 5 and 6 that are coalesced ; and (4) the completely different first male pleopod.

The carapace of the male holotype shows an impression marking the place where a sea anemone was situated.

DISTRIBUTION. — The species so far has only been found at Manora and Karachi, Pakistan.

10. *Doclea brachyrhynchus* Bleeker, 1856

(Figs. 30-33 ; pl. IX)

*Doclea sebae* Bleeker, 1856 : 64 (nomen nudum). — BLEEKER, 1856a : 13 (part). — BLEEKER, 1857 : 13 (part). — ORTMANN, 1893 : 47.

*Doclea brachyrhynchus* Bleeker, 1856a : 14. — BLEEKER, 1857 : 14.

*Doclea brachyrhynchus* ; MIERS, 1880 : 227. — ORTMANN, 1893 : 47.

*Doclea brachyrhyncha* ; BALSS, 1929 : 15, fig. 8.

MATERIAL EXAMINED

Nias, Sumatra, Indonesia ; 1891 ; J. D. PASTEUR ; RMNH 3162 : 2 ♂, 2 ♀.

Sibolga (= Sibogha), Sumatra, Indonesia ; BLEEKER coll. ; don. E. GERRARD Jr. ; BMNH 80.6 (part) : 1 ♂ (holotype *D. brachyrhynchus* Bleeker).

Padang, Sumatra, Indonesia ; RMNH 3163 : 1 ♂.

West Sumatra or Ambon, Indonesia ; BLEEKER coll. ; don. E. GERRARD Jr. ; BMNH 80.6 (part) : 1 ♂ (lectotype *D. sebae* Bleeker).

DESCRIPTION

The carapace is globular. The rostrum is incised in the middle for less than 0.5 mm at the utmost. The rostrum is so short that it does not pass the first basal antennal segment. Between the incision and the pair of submedian tubercles anterior of the median line the rostrum is with a sharp groove. In adults the tips of the rostrum are broad and converge somewhat. There is a broad incision between the orbital margin and the postorbital spine. The outer edge of the postorbital spine is convex.

In its median line the carapace carries eight tubercles or spines, of which the sixth and eighth are most pronounced. The first four tubercles are placed in the mesogastric region, the fifth in the urogastric, the sixth in the cardiac and the seventh and eighth are in the intestinal region, the eighth directed backward.

In the posterior part of the frontal region, just before the anterior median tubercle, there is a pair of submedian tubercles. In either protogastric region a longitudinal row of three tubercles is present, the two rows diverge posteriorly. The first of these tubercles lies at the same level as the second median tubercle. There are another two tubercles that are situated more submedian and at the same level as respectively the first and third tubercle of the protogastric row. The metagastric region shows a tubercle at either end of the anterior margin. The hepatic region carries only one tubercle. Either inner anterior part of the branchial region has five tubercles, of which one row of four tubercles. This row curves towards a position that is more dorsally, but at the same level as the last anterolateral spine. The fifth tubercle is situated at a level halfway between the first tubercle of the branchial row and the penultimate anterolateral spine. The branchial row lies in a direct line with the protogastric row.

The anterolateral border of the carapace is armed with four tubercles or spines. The first spine seems composed out of two tubercles, the second to fourth are increasing in size posteriorly. A tubercle, that is sometimes placed just before the first anterolateral spine, is not observed.



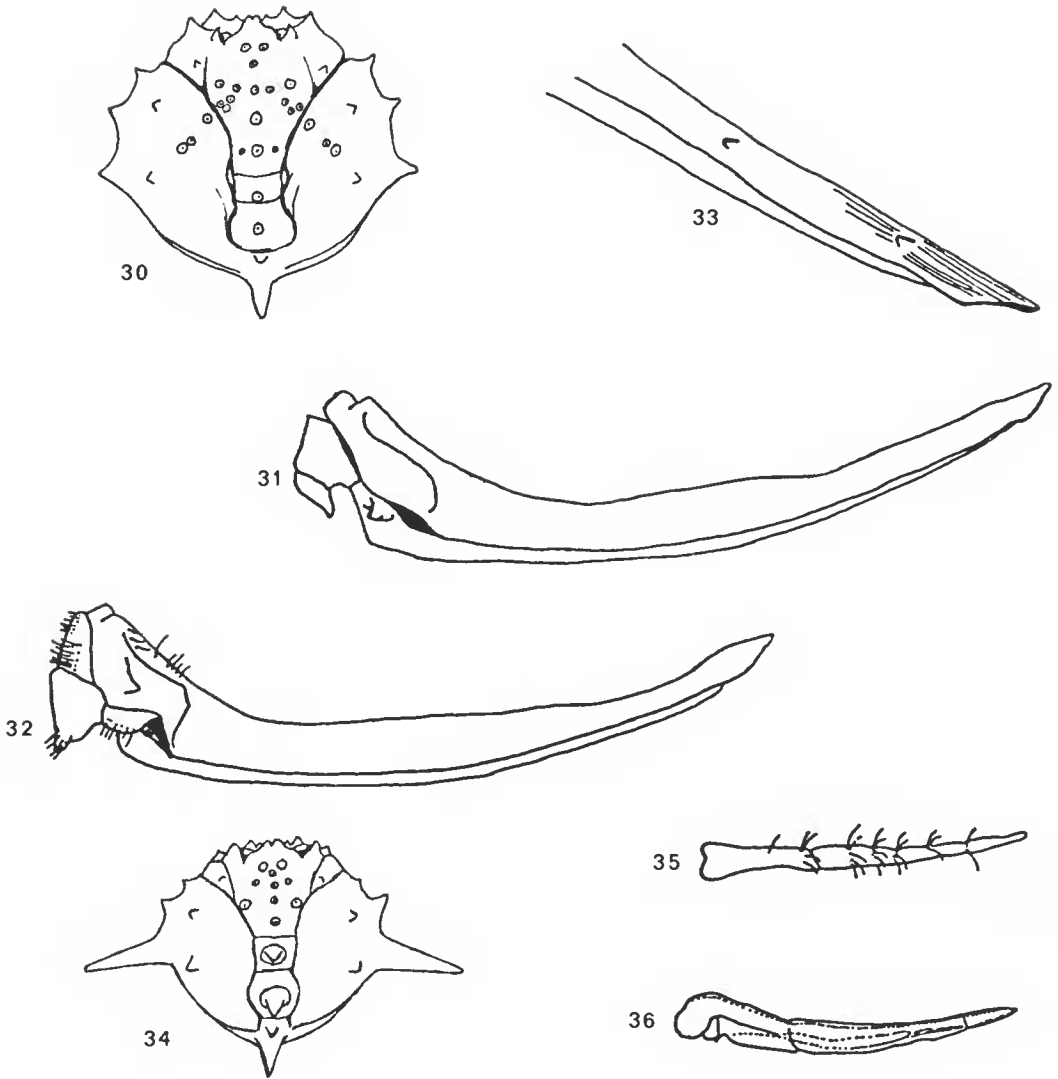


FIG. 30-36. — *Doclea brachyrhynchos* Bleeker : 30, ♀ (Nias, Sumatra, Indonesia, 1891, RMNH 3162), carapace, dorsal view, 1.15 × ; 31, ♂, holotype (Sibolga (= Sibogha), Sumatra, Indonesia, BMNH 80.6 (part)), right first pleopod, 7.5 × ; 32, ♂, lectotype *D. sebae* Bleeker (West-Sumatra or Ambon, Indonesia, BMNH 80.6 (part)), right first pleopod, 7.5 × ; 33, ♂ (Padang, Sumatra, Indonesia, RMNH 3163), detail of the tip of the right first pleopod, 21 × . — *Doclea macracanthus* Bleeker : 34, juvenile ♂, holotype (Ambon ? (West Sumatra), Indonesia, BMNH), carapace, dorsal view, 1.8 × ; 35, juvenile ♂ (Bay of Djakarta (Batavia), Java, Indonesia, ZMA), right first pleopod, 10 × ; 36, right first pleopod of the juvenile male of figure 34, 11.3 × .

The posterior spine of the basal antennal segment is highly reduced. There is a pterygostomial canal present.

In the adult male the chelae are globose. Their length is about two third of that of the carapace length. In the female the chelae have less than half the carapace length. The ambulatory legs of the first pair can be more than 3 1/2 times as long as the carapace length. The ambulatory legs are long and very slender and the dense pile extends from the base to the proximal part of the propodus.

In the male the abdominal segments are separate. The second abdominal segment has a weak median prominence and the third abdominal segment has submedian prominences. In the female the abdominal segments are also separate. The second abdominal segment has also a median prominence and the third to fifth abdominal segments have ventrolateral prominences.

There are in the male two sharp pointed submedian spines on the fourth thoracic somite, just before the seventh abdominal segment when the abdomen is in the normal position against the thorax.

The first pleopod of the male, when fully mature, is well chitinized and oval in transverse section. It is long, bent and tapers gradually into a rather sharp tip. The tip is grooved.

#### REMARKS

The specimens from the BLEEKER collection do fit exactly in his descriptions and leave no doubt that they are the original type specimens.

*Doclea sebae* was based by BLEEKER partly on his own material and partly on the specimen figured by SEBA (1759). The former belongs to *D. brachyrhynchos*, while SEBA's specimen clearly is *D. rissonii* (see also p. 907). *D. sebae* thus is a composite species and to fix its identity BLEEKER's own specimen is selected its lectotype. Thereby *D. sebae* becomes a junior subjective synonym of *D. brachyrhynchos*. *D. sebae* and *D. brachyrhynchos* were published simultaneously. BALSS (1929) synonymised the two and used the name *brachyrhynchos* in preference to *sebae*; his action constitutes a first revisor action and his decision must stand.

#### DISTRIBUTION

The species is so far only known from Java, Sumatra and Ambon, Indonesia.

The records of the species in the literature are the following : Padang, west coast of Sumatra, Indonesia (BALSS, 1929) ; Sibolga (= Sibogha), west coast of Sumatra, Indonesia (BLEEKER, 1856a, 1857) ; West Sumatra, Indonesia (BLEEKER, 1856a, 1857) ; Ambon, Indonesia (BLEEKER, 1856, 1856a, 1857).

11. *Doclea macracanthus* Bleeker, 1856

(Figs. 34-36 ; pl. VI)

*Doclea macracanthus* Bleeker, 1856a : 10. — BLEEKER, 1857 : 10.

*Doclea microchir* Bleeker, 1856a : 11. — BLEEKER, 1857 : 11. — ORTMANN, 1893 : 47. — BUITENDIJK, 1939 : 249.

*Doclea macracantha* ; MIERS, 1880 : 227. — ORTMANN, 1893 : 47. — BALSS, 1929 : 15, fig. 7.

MATERIAL EXAMINED

Bay of Djakarta (Batavia), Java, Indonesia ; C. Ph. SLUITER coll. ; ZMA : 1 juv. ♂.

Padang, Sumatra, Indonesia ; RMNH 3150 : 1 juv. ♀.

Ambon? (or West Sumatra), Indonesia ; BLEEKER coll. ; don. E. GERRARD Jr. ; BMNH : 1 juv. ♂ (holotype *D. macracanthus* Bleeker).

DESCRIPTION

The carapace is globular. The rostrum is incised in the middle for 0.5 mm at the utmost. Between the incision and the pair of submedian tubercles anterior of the median line the rostrum is clearly grooved. The rostrum is so short that it does not pass the basal antennal segment. In adults the tips of the rostrum are broad and converging towards each other. There is a narrow incision between the orbital margin and the postorbital spine. The outer edge of the postorbital spine is convex.

In its median line the carapace carries eight tubercles or spines, of which the sixth and eighth are most pronounced. The first four tubercles are placed in the mesogastric region, the fifth in the urogastric, the sixth in the cardiac and the seventh and eighth are in the intestinal region, the eighth directed backward.

In the posterior part of the frontal region, just before the anterior median tubercle, there is a pair of submedian tubercles. In either protogastric region a longitudinal row of two tubercles is present, the two rows diverging posteriorly. The first of these tubercles lies at a level slightly before the second median tubercle. The other one is placed at a level slightly behind the third median tubercle. The metagastric region shows no tubercles at either end of the anterior margin. The hepatic region carries only one tubercle. Either inner anterior part of the branchial region has two tubercles of which first is at the same level as the penultimate anterolateral spine and the second one is at the same level as the last anterolateral spine.

The anterolateral border of the carapace is armed with four tubercles or spines. The first spine is very broad and carries three minute spinules, the second to fourth are increasing in size posteriorly. The tubercle, that in other species is sometimes placed just before the first anterolateral spine, is not observed in the material of the present species.

The posterior spine of the two spines of the basal antennal segment is the smaller. A pterygostomial canal is present.

In the males that are at my disposal the chelae are globose (as they are in all juvenile *Doclea*) and more than one third as long as the carapace. In the female specimen the chela likewise is about one third as long as the carapace. The ambulatory legs of the first pair is

3 to 3 1/2 times as long as the carapace. The ambulatory legs are long and very slender and the dense pile extends from the base to the proximal part of the dactylus.

In the male the abdominal segments 3, 4, 5 and 6 are coalesced. The second abdominal segment has a median prominence. In the female the abdominal segments 3, 4, 5 and 6 are also coalesced; the second abdominal segment has a weak median prominence.

The male shows two submedian spines on the fourth thoracic somite, just before the seventh abdominal segment when the abdomen is in the normal position against the thorax.

No adult male was examined by me. In the juvenile male the first pleopod is not yet fully chitinized. It is circular in transverse section, straight, long and gradually tapering. The gonopod of the juvenile male specimen of the ZMA shows five transverse rows of hairs in the middle half.

#### REMARKS

The species shows a close resemblance to *D. brachyrhynchos*, but can be distinguished by: (1) having a different number of tubercles on the protogastric and branchial regions; (2) the presence of coalesced abdominal segments (which is probably due to the fact that the specimens are juvenile); and (3) the difference in pubescence of the ambulatory legs. The material studied was not sufficient to definitely decide whether the species is a young of *D. brachyrhynchos* or a species on its own.

According to BLEEKER's description of *D. macracanthus* (1856a : 11) the holotype specimen originated from Ambon. On page 5 and 6 of the same publication Sumatra is cited as original locality. As BLEEKER (1856) in his travel report to Ambon did not mention the species from Amboina, his 1856a mention of the species from Amboina may be in error.

#### DISTRIBUTION

The species is only known from Java, Sumatra and perhaps from Ambon, Indonesia.

The records of the species in the literature are the following: Padang, Sumatra, Indonesia (BLEEKER, 1856a, 1857; BALSS, 1929; BUITENDIJK, 1939); Ambon, Indonesia (BLEEKER, 1856a, 1857).

*Several species have been placed in the genus Doclea that do not belong there.  
In the following list all such species are discussed.*

#### 1. *Doclea bidentata* (A. Milne Edwards, 1873)

MATERIAL EXAMINED. — North east coast of Yeso Island, Hokkaido, Japan; J. G. JEFFREYS coll.; H. C. ST. JOHN; BMNH 1873.28 : 1 ♀ (syntype *Doclea orientalis* Miers). Kunashir Island, Kuril' Skiye Ostrova, U. S. S. R.; 44°20' N-146°00' E; J. G. JEFFREYS coll.; H. C. ST. JOHN; BMNH 1873.28 : 1 ♀ (syntype *Doclea orientalis* Miers).

*Doclea expansa* (A. Milne Edwards, 1878) and *Doclea orientalis* Miers, 1879, were placed in the synonymy of *Doclea bidentata* by respectively RATHBUN (1918 : 17) and ORTMANN (1893 : 48). Examination of MIERS' types confirmed the correctness of ORTMANN's views.

According to BALSS (1929 : 14) the species does not belong to *Doclea*, he though it more likely to belong to *Pugettia* or *Hyas*. SAKAI (1938 : 290) assigned the species to the genus *Pisoides* A. Milne Edwards & Lucas, 1843.

2. *Doclea expansa* (A. Milne Edwards, 1878)

Treated as a synonym of *D. bidentata* (A. Milne Edwards, 1873) (see there) by RATHBUN (1918).

3. *Doclea fabriciana* Risso, 1827

*Doclea fabriciana* Risso, 1827, with its manuscript synonyms *Doclea Latrillia* and *Doclea Herbstii* (see HOLTHUIS, 1977 : 74) is a species of *Inachus* Weber, 1795, as H. MILNE EDWARDS (1834 : 290) already remarked. It is not clear however to which of the two species, *I. dorsettensis* (Pennant, 1777) and *I. communissimus* Rizza, 1839, *D. fabriciana* belongs.

4. *Doclea Herbstii* (Risso MS)

See *D. fabriciana* Risso, 1827 (p. 929 above).

5. *Doclea indicus* (Leach, 1815)

The species, described as *Egeria indica* (and type species of that genus by monotypy) was assigned to the genus *Doclea* by LATREILLE (1817). Later authors placed it in *Phalangipus* Latreille, 1828, a synonym of the preoccupied *Egeria*.

6. *Doclea lar* (Fabricius, 1793)

FABRICIUS described this species as *Cancer lar*. The same author relegated the species to the genus *Inachus* in 1798. Then the species was placed in *Maia* by BOSCH (1802 : 253) and finally in *Doclea* by LATREILLE (1817 : 517). Since then there are no records anymore about this species. Photographs of the dry syntype material from the FABRICIUS collection kindly sent to me by Dr Torben WOLFF of the ZMC, showed that these belong to a species of *Phalangipus*, probably *Phalangipus longipes* (L., 1758).

7. *Doclea Latrillia* (Risso MS)

See *D. fabriciana* (Risso, 1827) (p. 929 above).

8. *Doclea longipes* (L., 1758)

The species was considered by LATREILLE (1817) to belong to *Doclea*. In 1828, LATREILLE created the genus *Phalangipus* with the present species as the type. H. MILNE EDWARDS (1834) placed *Cancer longipes* L. in the synonymy of *Egeria arachnoides* Rumphius, 1705. GRIFFIN (1973) established the correct name of the species as *Phalangipus longipes*.

9. *Doclea orientalis* Miers, 1879

This species was treated as a synonym of *D. bidentata* (see there, p. 928) by ORTMANN (1893 : 48).

10. *Doclea profunda* Rathbun, 1918

RATHBUN (1918 : 16, pl. 7 figs. 1, 2) described from the Australian Bight, 250-450 fathoms, a new species of *Doclea*, *D. profunda*. Judging by the photographs published by RATHBUN the species seems to have a pterygostomial ridge and in shape does remind of *Pisoides*. RATHBUN stated in her description that the species closely resemble *Pisoides bidentata*, which species she still considered a *Doclea*. *D. profunda* was reported from 250-450 fathoms, a depth from which no *Doclea* ever has been reported. *Doclea* species have been found at depths between 0 to 60 m. The three species of *Pisoides* however were found at depths between 0 to 150 m. It seems likely that *D. profunda* should be referred to the genus *Pisoides*.

11. *Doclea spinifer* (L., 1758)

LINNAEUS (1758 : 629) reported this species from Asia under the name *Cancer spinifer*, FABRICIUS (1798 : 559) placed it in *Inachus*, BOSC (1802 : 253) in *Maia* and LATREILLE (1817 : 517) in *Doclea*. Later authors completely ignored the species. The identity of the species is doubtful. LINNAEUS's (1758) description is short with a queried reference to Rumphius's pl. 8 fig. 3 (= *Parthenope pelagica* (Rüppel)). In 1764, LINNAEUS (Mus. Ludovicae Ulricaë : 447) gives a slightly more extensive description, but still insufficient for a certain identification of the species, HOLM (1957 : 56) in a list of the material of the collection of Queen Ludovica Ulrica at present still preserved in the Zoological Institute of Uppsala University listed a single specimen of *Cancer spinifer*, which thus should be the specimen described by LINNAEUS (1764) and possibly is the type of *Cancer spinifer*. This specimen in HOLM's list is identified (by A. EURÉN) as "*Ilia rugulosa* Roux". LINNAEUS's description of *Cancer spinifer* does not fit *Ilia* at all and shows more features found in *Phalangipus*. A re-examination of the Uppsala specimen might bring a solution, otherwise *Cancer spinifer* will remain a species incerta.

#### DISCUSSION

Taxonomically the eleven species of *Doclea* recognized here fall into three groups. The first comprises seven species and is characterized by a long rostrum, the absence of spinules on the upper orbital margin and, in the males, the presence of sternal spines as a locking device for the abdomen. The distribution of the first group is the Indian Ocean and the western Pacific.

The second group comprises the two species *D. alcocki* Laurie, 1906, and *D. aduncus* n. sp. These species are characterized by having the longest rostrum, the presence of spinules on the upper orbital margin and lacking the sternal spines in the males. Until now the second group has only been recorded from the Indian Ocean.

The third and last group is formed by *D. brachyrhynchos* Bleeker, 1856, and *D. macracanthus* Bleeker, 1856. Both are characterized by an extremely short rostrum, much so that these species cannot be confused with the species of the other two groups. The sternal spines are usually more prominent than those of the species of the first group. In this group only the first anterolateral spine seems composed out of more than one tubercle. The third group has so far only been reported from Indonesia.

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PLATE I

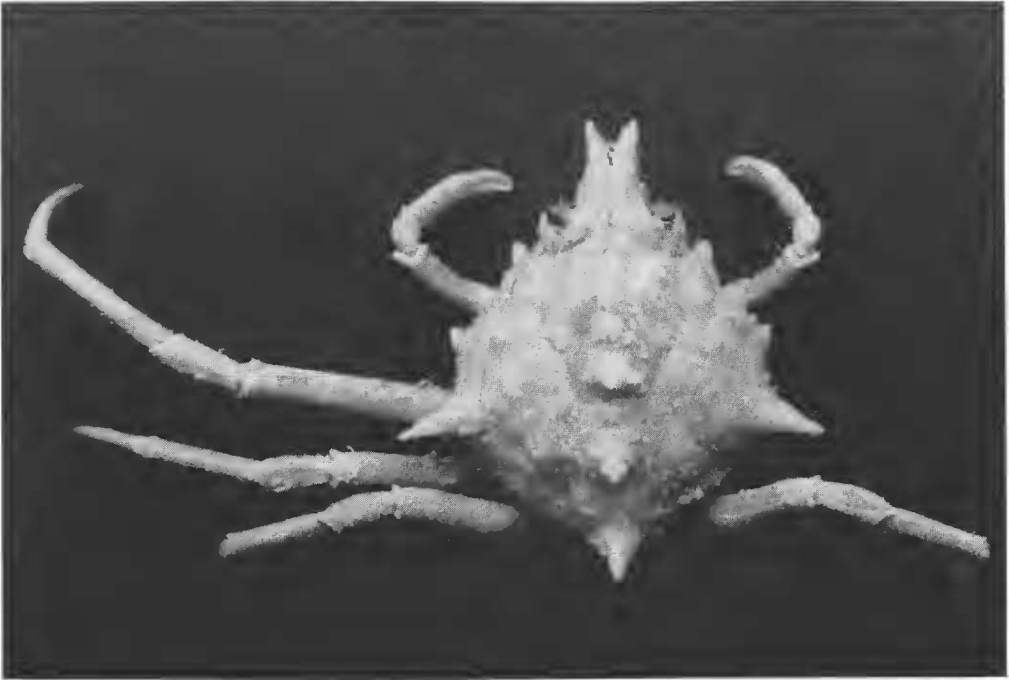
Above : *Doclea ovis* (F.) with sea anemones still attached (East Coast, Singapore ; 10 August 1982 ; P. K. L. NG). (Photo : H. K. YIP, NMS.)  
Below : *Doclea ovis* (F.) : male (? Bay of Bengal (possibly Tranquebar), India), BMNH, BANKS coll.), dorsal view, ca. 0.68 ×.



PLATE I

PLATE II

Above : *Doclea ovis* (F.) : juvenile female (Malacca, BMNH 1900.10.22.10 (part)), dorsal view, ca. 2.79 × .  
Below : *Doclea rissonii* Leach : juvenile male (Sri Lanka (Ceylon), BMNH 1907.5.22.124-128), dorsal view,  
ca. 3.12 × .

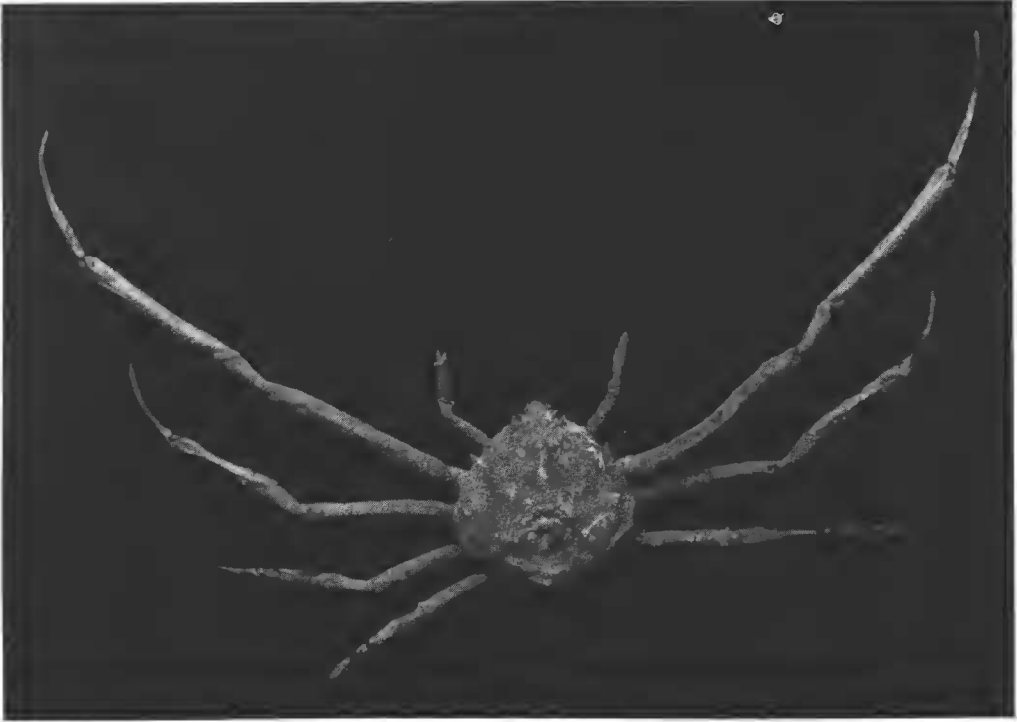


*PLATE II*

PLATE III

Above : *Doclea rissonii* Leach : female, holotype (locality unknown, BMNH 81a), dorsal view, ca. 0.51 ×.  
Below : *Doclea rissonii* Leach : male (East Coast Singapore, RMNH 36158), dorsal view, ca. 0.81 ×.



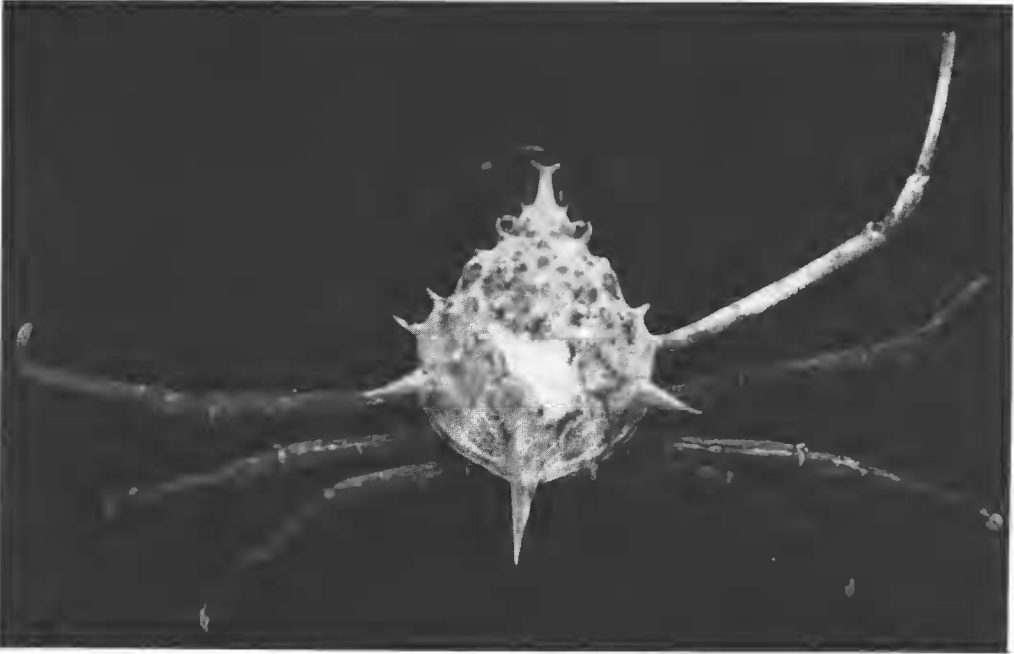


*PLATE III*

PLATE IV

Above : *Doclea armata* De Haan : female, holotype (Padang, Sumatra, Indonesia, RMNH 36155), dorsal view, ca. 1.02 ×.

Below : *Doclea armata* De Haan : male, holotype of *D. calcitrata* White (Zebu (Cebu), Philippine Islands, BMNH 1843.6), dorsal view, ca. 0.96 ×.



*PLATE IV*

PLATE V

Above : *Doclea armata* De Haan : juvenile male, syntype of *D. tetraptera* (Singapore, BMNH 1908.12.8.30-31), dorsal view, ca. 1.71 ×.

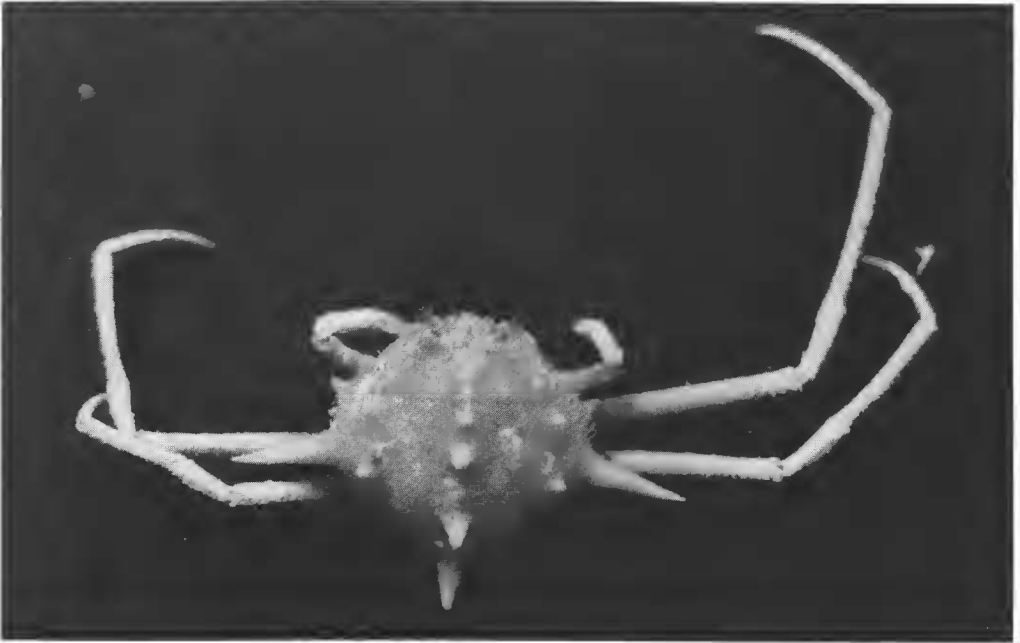
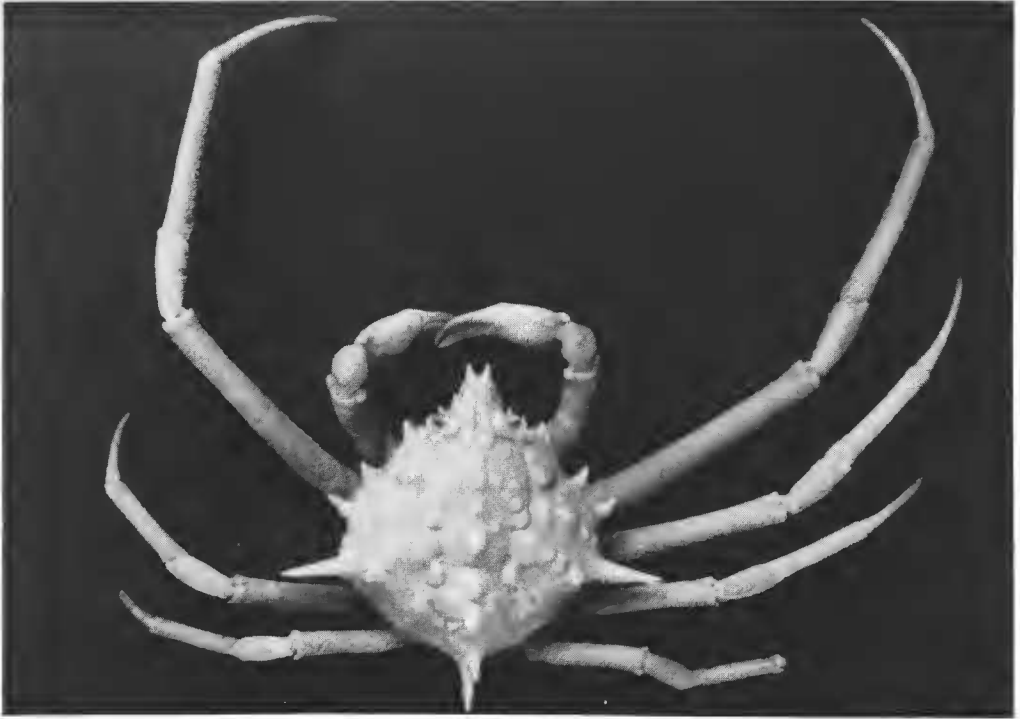
Below : *Doclea muricata* (F.) : male, lectotype of *D. hybrida* (F.) (? Bay of Bengal (possibly Tranquebar), India, ZMC), dorsal view, ca. 0.82 ×.



PLATE V

PLATE VI

Above : *Doclea canaliformis* Lovett : male, lectotype (Siglap, Singapore, NMS), dorsal view, ca. 1.42 ×.  
Below : *Doclea macracanthus* Bleeker : juvenile male, holotype (Ambon ? (West-Sumatra), Indonesia, BMNH),  
dorsal view, ca. 2.37 ×.



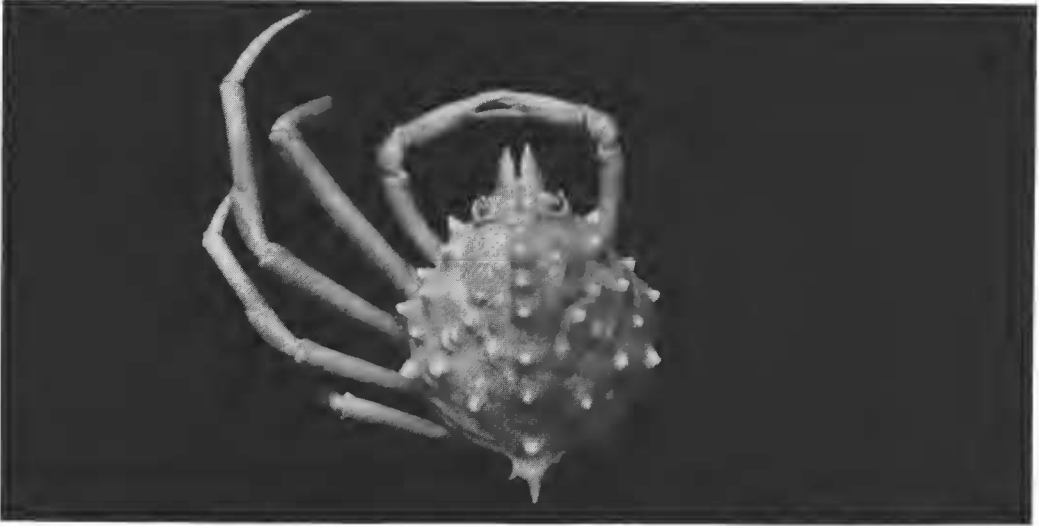
*PLATE VI*

PLATE VII

Above : *Doclea alcocki* Laurie : female, holotype (Pearl Banks, Gulf of Manaar, Sri Lanka (Ceylon), BMNH 1907.5.22.129), dorsal view, ca. 0.75 ×.

Below : *Doclea alcocki* Laurie : male (Sri Lanka (Ceylon), MP-B 12681), dorsal view, ca. 1.64 ×.

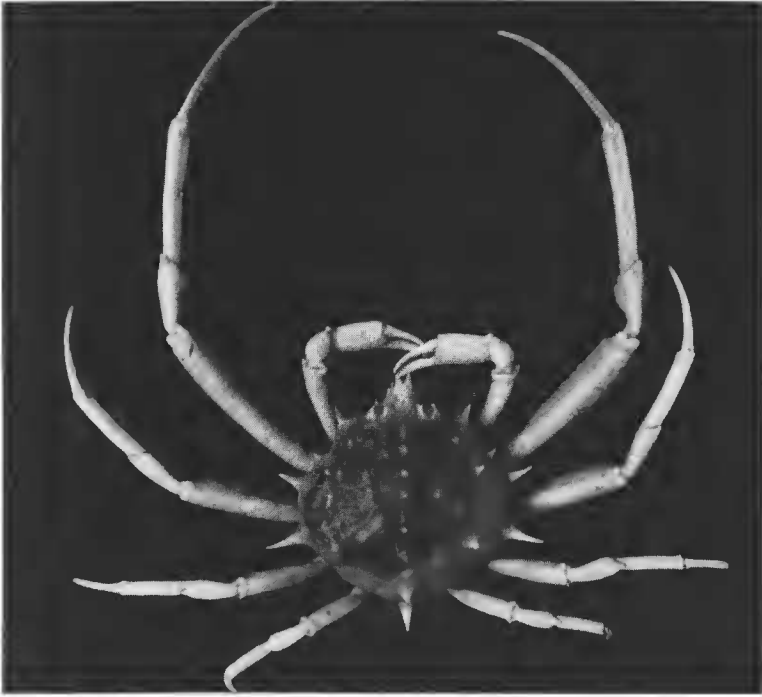




*PLATE VII*

PLATE VIII

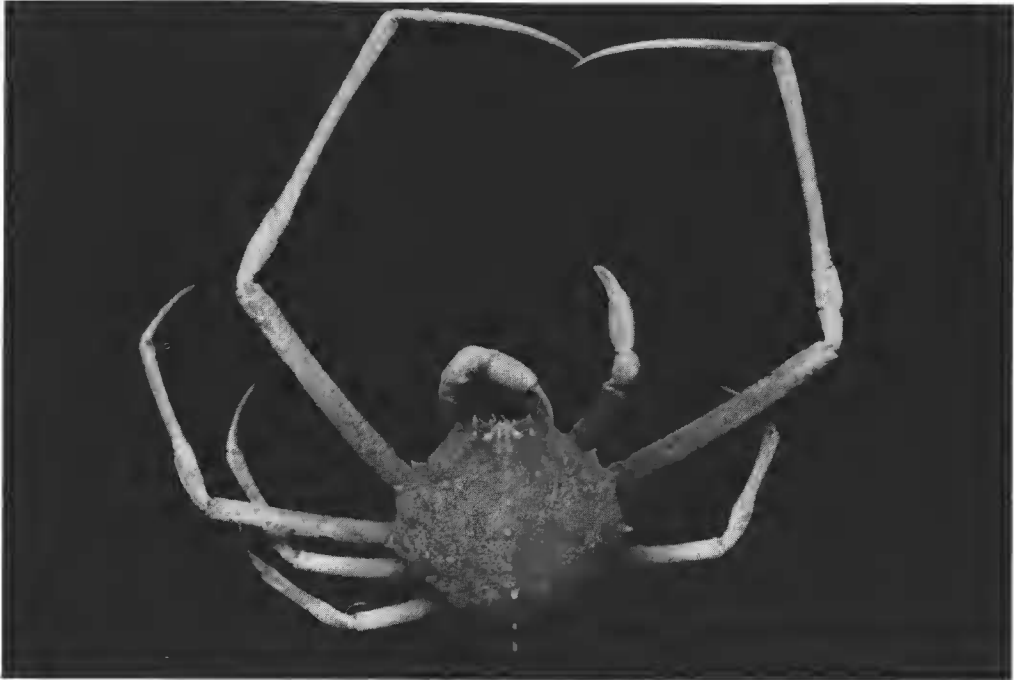
Above : *Doclea aduncus* n. sp. : male, holotype (Fish Harbour, Karachi, Pakistan, RMNH 36241), dorsal view,  
ca. 0.66 ×.  
Below : *Doclea aduncus* n. sp. : female, paratype (Fish Harbour, Karachi, Pakistan, UKK), dorsal view,  
ca. 0.80 ×.



*PLATE VIII*

PLATE IX

- Above : *Doclea brachyrhynchos* Bleeker : male, holotype (Sibolga (= Sibogha), Sumatra, Indonesia, BMNH 80.6 (part)), dorsal view, ca. 0.90 × .
- Below : *Doclea brachyrhynchos* Bleeker : male, lectotype of *D. sebae* Bleeker (West-Sumatra or Ambon, Indonesia, BMNH 80.6 (part)), dorsal view, ca. 0.90 × .



*PLATE IX*